

BUILDING ECONOMICS PRE-COURSE STUDENT PERCEPTIONS

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Tertiary Students' pre-course perceptions of a subject provide insight relative to their understanding and appreciation of a subject and challenges that the lecturer may encounter. Furthermore, post-course perceptions can be compared with pre-course perceptions to determine the impact of the presentation of the subject, if any. The purpose of the study reported on is to determine the pre-course Building Economics perceptions of construction management and quantity surveying students, based upon a self-administered questionnaire survey conducted in a South African university. The students were surveyed at the inception of the presentation of the subjects. Findings include: material costs, labour rates, and profit margins predominate in terms of the importance of Building Economics knowledge areas to CMs, and cost control, measuring (quantities), and estimating relative to QS; accurate estimating, design and specification changes, material availability, labour productivity, material availability, and inflation predominate in terms of the extent various aspects contribute to project cost control, and the knowledge gained from the subject will assist students in other modules, and the subject teaches students skills which they can apply in everyday life. Based upon the findings it can be concluded that students have a degree of understanding and appreciation of the subject Building Economics prior to exposure thereto, and they understand and appreciate the importance and role of the subject Building Economics to their programmes and disciplines. It is recommended that such research be conducted on an annual basis, and a preparatory lecture module 'The role and importance of Building Economics' should be evolved for first time Building Economics students.

Keywords: Building Economics, perceptions, students, South Africa

INTRODUCTION

The Literature indicates that students commence courses with pre-conceived notions with respect to the courses, which are possibly influenced by normative views of members of the larger campus community (Heise, 1979, 2002 in Francis, 2011). Furthermore, results of prior research have shown student attitudes toward a course before the start of the semester affect student course evaluations (Barke, Tollefson and Tracy, 1983 in Francis, 2011). Research conducted by Barth (2008) in Francis (2011) relative to student evaluations, using factor analysis, determined that prior 'interest in the subject matter' was shown to have a significant impact on the overall course ratings.

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Given the aforementioned, and the Department of Construction Management's focus on 'lecturing and learning' research in addition to general assessment of courses, programmes, and related interventions such as portfolio and integrative projects and vacation work, a survey was conducted among construction management (CM) and quantity surveying (QS) students registered for the subject Building Economics to determine the perceived:

- importance of Building Economics knowledge areas to CMs and QSS;
- extent to which twelve aspects impact on project cost control, and
- relevance of the subject Building Economics in terms of the other modules in the CM and QS programmes, practice post-graduation, and everyday life.

REVIEW OF THE LITERATURE

Programme evaluation

According to Springer (2010), programme evaluation is the process of evaluating the merit and effectiveness of educational programmes. Although evaluations are research-based, the goal is not simply to understand programmes, but also to arrive at judgments about their impact and worth.

Two studies conducted by Gigliotti (1987) and Koermer and Petelle (1991) cited in Francis (2011) addressed the effect of student pre-course expectations on subsequent course evaluations. These significant associations with student evaluations included expected relevance and expected stimulation and communications as types of interaction in a course. Research also shows student ratings of courses vary significantly by field of study (Cashin, 1990 in Francis, 2011), suggesting the presence of normative attitudes toward various disciplines on a campus.

Francis (2011, citing Cashin, 1990) says that students rated the management field low for instructor and course effectiveness in contrast to higher ratings for courses in the 'hard sciences' such as physics. Biglan (1973, cited by Francis 2011) provide insight on distinguishing between academic fields with three dimensions to classify specific courses. For example, 'hard' versus 'soft' addresses the extent of competing theories within a field; 'pure' versus 'applied' considers the practical application of a field, and the third dimension is whether a field is concerned with living objects or not. The subject of the empirical study, Building Economics, could be described as 'hard', 'applied', and not concerned with 'living objects'. Related to this topic is a study which determined that student perceptions of course relevance at the second class meeting were lower for an organisational behaviour course as a 'social science' compared to perceptions of a computing course (Burke and Moore, cited by Francis 2011). The subject of the empirical study, Building Economics, could be construed to be similar to a computing course. These results suggest two antecedents impact student course evaluations, namely pre-course attitudes and discipline of the course.

Education Frameworks

The 'Economic Principles and Financial Management' theme of Section 2.2 'The Construction Environment' of 'The Education Framework for Undergraduate Degrees' of the Chartered Institute of Building (CIOB) (CIOB, 2012) records, inter alia, as requirements for Construction Management programmes at:

- Level 4: finance for construction activities; cash flow, and price and cost estimation for construction activities;
- Level 5: produce examples of price and cost estimation for construction activities; appraise the use of financial information as it relates to the management of construction projects: cash flow, cost and finance; value management / engineering, and decision making, and
- Level 6: implement procedures and practices associated with the settlement of final accounts, claims, and dispute resolution.

Importance of Building Economics

A study conducted by Crafford (2007) determined the top three out of thirty-three quantity surveying competencies in terms of percentage importance to be:

- cost control (94.6%);
- estimating (94.5%), and
- measurement (quantities) (94.4%).

Thereafter, valuation was ranked twelfth (82.0%), and advanced financial management twenty-second (76.5%). Furthermore, it is notable that four of the top five competencies in terms of deficiency as determined by a gap analysis conducted by comparing importance versus evidence, are estimating, economics of construction, cost control, and measurement.

Then, in terms of thirty-two construction management competencies:

- measurement (quantities) was ranked fifth (76.5%);
- cost control ninth (75.3%);
- estimating tenth (75.2%);
- valuation twenty-fourth (69.2%), and
- advanced financial management twenty-seventh (67.8%).

Although some of the aforementioned Building Economics competencies were ranked low, their percentage importance scores were high, which belies their importance. In terms of deficiency, advanced financial management was ranked sixth among the top six competencies.

A study conducted by Manthe (2008) investigated the appropriateness of, inter alia, CM and QS tertiary built environment education. The responses of built environment practitioners that were members of the Association of South African Quantity Surveyors (ASAQS) and registered with the South African Construction and Project Management Professions (SACPCMP) are included in Table 1 below. With the exception of the subject Construction Economics relative to CM according to members of the ASAQS, the majority of respondents responded in the affirmative to Price Analysis and Estimating, Quantities and Measurement, and Construction Economics.

Table 1: Importance of Building Economics related subject areas to CM and QS

Subject Area	Association	Response (%)	
		CM	QS
Price Analysis and Estimating	ASAQS	69.4	97.2
	SACPCMP	78.3	87.0
Quantities and Measurement	ASAQS	66.7	94.4
	SACPCMP	73.9	91.3
Construction Economics	ASAQS	58.3	97.2
	SACPCMP	91.3	87.0

A study conducted by Smallwood (2006) investigated, inter alia, the importance of seventy-eight knowledge areas and forty-five skills to three levels of management, namely, operational, middle, and top. In terms of Building Economics related knowledge areas the mean rankings and importance index (between 0 and 4) are as follows:

- cost control was ranked joint sixth (2.53, but 2.73 for middle);
- measuring (quantities) thirteenth (2.30, but 2.81 for operational);
- estimating twenty-first (2.03, but 2.38 for top);
- financial management twenty-eighth (1.81, but 2.70 for top);
- cost engineering thirty-seventh (1.60, but 1.81 for middle);
- cash flow forecasting joint forty-eighth (1.25, but 1.81 for top);
- final accounts joint forty-eighth (1.25, but 1.53 for top), and
- valuing sixty-ninth (0.86).

In terms of skills:

- costing was ranked eighteenth (2.51);
- measuring (quantities) nineteenth (2.38, but operational 2.92);
- financial twenty-fifth (2.21, but 3.10 for top), and
- estimating joint twenty-ninth (1.90, but 2.36 for top).

Generally, the subject Building Economics and related aspects are important to both CMs and Qs according to practitioners.

RESEARCH METHOD

Subject content

Although the module name is Building Economics 2, it is the first instance that Building Economics as a subject stream is introduced to the students, i.e. there is no Building Economics 1.

In the course Building Economics 2, students learn the theory and methodology of calculating unit rates and pricing for all building trades as well as pricing for preliminaries, preparing cash flow calculations, and contractor tender approaches.

Building Economics 3 exposes students to a variety of factors which can affect the 'economics' of a project, such as town planning schemes, building shape, and site location, as well as introducing them to various methods of measurement and

estimating, although the course is focused on elemental estimating and elemental cost analysis. The effects of inflation as well as the requirements for allowances for contingencies and taxation are also addressed.

It should be noted that Building Economics 2 is attended by 2nd year QS students and 3rd year CM students. Building Economics 3 is attended by 3rd year QS students and 4th year (honours level) CM students. There is a Building Economics 4 course which covers forecasting and analysis of construction costs as integrated into the property development process. This course was not included in the study as only 4th year QS students attend.

Sample stratum

The sample stratum consisted of construction management (CM) and quantity surveying (QS) students registered for the subject Building Economics. The students were surveyed during the first lecture of the first semester using a self-administered questionnaire consisting of six questions, five of which were five-point Likert scale type questions. 69 Students responded, 35.9% of which were CM and 64.1% were QS. 35.8% of the students have some form of construction work related experience, and 64.2% did not.

Research findings

Table 2 indicates the importance of twenty knowledge areas to construction managers and quantity surveyors in terms of means scores (MSs) between 1.00 and 5.00, based upon percentage responses to a five point scale of 1 (not) to 5 (very). The results have been presented per discipline according to each of the responding disciplines. Based upon CM responses, 15 (75%) of the CM MSs are $> 4.20 \leq 5.00$ (between more than important to very important / very important), whereas only 3 (15%) of the QS MSs are. The three common knowledge areas are: labour rates; material costs, and overheads. Furthermore, every CM MS is higher than the corresponding QS MS. Due to the lower QS MSs, only 5 (25%) of the mean MSs are $> 4.20 \leq 5.00$. The top five CM knowledge areas in terms of the mean are: material costs; labour rates; profit margins; overheads, and budgeting. The top five QS knowledge areas in terms of the mean are: cost control; measuring (quantities); estimating; cost analysis, and pricing. Notable differences in importance include the following knowledge areas, which in fact are very important in terms of the practice of construction management: cost control; measuring quantities; estimating; pricing; schedules of rates; cash flow forecasting; financial management; budgeting, and cost analysis.

Based upon QS responses, 17 (85%) of the CM student MSs are $> 4.20 \leq 5.00$, and 18 (90%) of the QS student MSs are. It is notable that 12 (60%) of the CM MSs are higher than the corresponding QS MSs, however marginally so, with the exception of town planning conditions, programming, and interest rates. Due to the generally high CM and QS MSs, 18 (90%) of the mean MSs are $> 4.20 \leq 5.00$.

Table 2: Importance of knowledge areas to Construction Managers (CMs) and Quantity Surveyors (Qs) according to CM and QS students

Knowledge area	CM responses				QS responses			
	MS		Mean	rank	MS		Mean	rank
	CM	QS			CM	QS		
Cost control	4.61	3.77	4.19	6	4.86	4.87	4.87	1
Measuring (Quantities)	4.09	3.58	3.83	18	4.82	4.83	4.82	2
Mathematics	3.83	3.73	3.78	19=	4.23	4.30	4.26	17
Inflation	4.05	3.72	3.88	17	4.41	4.35	4.38	16
Estimating	4.30	3.26	3.78	19=	4.77	4.83	4.80	3
Pricing	4.43	3.78	4.10	9	4.73	4.80	4.76	5
Schedules of rates	4.39	3.61	4.00	11	4.64	4.50	4.57	9
Cash flow forecasting	4.52	3.43	3.98	14=	4.50	4.44	4.47	14
Financial management	4.65	3.65	4.15	7	4.41	4.56	4.49	13
Town Planning conditions	4.33	3.82	4.07	10	3.59	3.11	3.35	20
Programming	4.26	4.03	4.14	8	3.73	3.46	3.59	19
Budgeting	4.57	4.00	4.28	5	4.50	4.53	4.51	11
Cost analysis	4.35	3.62	3.98	14=	4.77	4.77	4.77	4
Labour rates	4.57	4.40	4.48	2	4.18	4.25	4.22	18
Material costs	4.57	4.50	4.53	1	4.45	4.67	4.56	10
Overheads	4.48	4.30	4.39	4	4.55	4.38	4.46	15
Profit margins	4.77	4.18	4.47	3	4.64	4.59	4.61	8
Analysis of final accounts	4.09	3.89	3.99	12=	4.68	4.74	4.71	6=
Interest rates	4.13	3.66	3.89	16	4.64	4.36	4.50	12
Cost planning	4.36	3.63	3.99	12=	4.64	4.78	4.71	6=

Table 3 indicates the perceived extent to which twelve aspects impact on project cost control in terms of MSs between 1.00 and 5.00, based upon percentage responses to a five point scale of 1 (minor) to 5 (major). The results have been presented per discipline and then in terms of a mean of the aforementioned. 6 (50%) of the CM student MSs are $> 4.20 \leq 5.00$ (between a near major to major / major extent), whereas only 2 (16.7%) of the QS student MSs are. However, a further 3 (25%) of the CM student MSs are marginally below 4.20, and similarly 4 (33.3%) of the QS student MSs. It is notable that 11 (91.7%) of the CM MSs are higher than the corresponding QS MSs. Due to the generally lower QS student MSs, only 4 (33.3%) of the mean MSs are $> 4.20 \leq 5.00$. 1 (8.5%) MS is marginally below 4.20. The top five CM aspects are: accurate estimating; design and specification changes; labour productivity; material availability, and contingencies. The top five QS aspects are: design and specification changes; accurate estimating; labour productivity; inflation, and provisional sums. It is notable that 3 / 5 (60%) of the top five aspects are common to both the CMs and Qs. Although the results constitute pre-course perceptions, the aforementioned need to be noted and emphasis placed on the aspects that do in fact impact on project cost control to a greater extent than that as perceived by the respondents.

Table 3: Extent to which twelve aspects impact on project cost control.

Aspect	CM		QS		Mean	
	MS	Rank	MS	Rank	MS	Rank
Accurate estimating	4.64	1	4.31	2	4.42	1
Design and specification changes	4.50	2	4.38	1	4.39	2
Labour productivity	4.41	3	4.18	3	4.22	3
Material availability	4.36	4	4.15	6	4.22	4
Inflation	4.26	6	4.16	4	4.19	5
Provisional sums	4.05	10	4.16	5	4.11	6
Size of construction firm	4.18	7	4.03	7	4.02	7
Contingencies	4.26	5	3.94	8	4.02	8
Site conditions	4.18	8	3.88	9	3.96	9
Tender methods	4.05	11	3.84	10	3.90	10
Type of contract	3.95	12	3.63	11	3.80	11
Type of subcontractor	4.14	9	3.45	12	3.70	12

Table 4 indicates the degree of concurrence with three Building Economics (QBE) subject related statements. Whereas the CM MS relative to ‘QBE knowledge will assist me in other modules’ is $> 4.20 \leq 5.00$ (between agree to strongly agree / strongly agree), the QS MS was marginally below 4.20. This constitutes an appropriate response as it is the case. Both the CM and QS MSs relative to ‘I will never apply my QBE knowledge after completing my degree’ are $\geq 1.00 \leq 1.80$ (strongly disagree to disagree). The response relative to ‘QBE teaches me skills which I can apply in everyday life’ is notable as it constitutes recognition of the value and relevance of the subject in general. The respective MSs are both $> 3.40 \leq 4.20$ (neutral to agree / agree). The knowledge and skills acquired will, *inter alia*, assist in terms of managing most businesses, and also most aspects of individuals’ personal life.

Table 4: Degree of concurrence with Building Economics (QBE) subject related statements.

Knowledge Area	MS		
	CM	QS	Mean
QBE knowledge will assist me in other modules	4.43	4.11	4.23
I will never apply my QBE knowledge after completing my degree	1.50	1.21	1.32
QBE teaches me skills which I can apply in everyday life	4.00	3.68	3.80

CONCLUSIONS

Generally, the subject Building Economics and related aspects are important to both CMs and Qs according to practitioners. Furthermore, the education frameworks of the CIOB and RICS require that these be addressed.

The students have an understanding and appreciation of the importance of twenty Building Economics related knowledge areas to CMs and Qs. However, the QS students’ understanding and appreciation thereof relative to CMs is lacking. Similarly, the students have an understanding and appreciation of the extent to which twelve aspects impact on project cost control.

The students have a positive disposition towards the subject Building Economics in terms of use of the related knowledge relative to other modules in the respective programmes, and the practice of the respective disciplines post-graduation. This is likely to engender commitment to the subject, and consequently complement performance relative to the subject.

RECOMMENDATIONS

It is recommended that pre-course perception based research be conducted on an annual basis, and a preparatory lecture module 'The role and importance of Building Economics' should be evolved for first time Building Economics students. The latter should address the relevance of the subject Building Economics and related aspects to both CMs and Qs during their studies and practice after graduating. The linkages with other subjects should also be highlighted to raise the level of awareness of the complementary role of subjects in the respective programmes and also the 'integration' of knowledge even though 'integrative' projects may be included in the respective programmes.

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