Ferdinand Fester & Theo Haupt

Construction Management Experiential Learning: Views of Employers and University of Technology Academics

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Abstract

Academic curriculum change in the main is driven by policy, industry or faculty. In South Africa, several policy initiatives are directed at influencing changes to the curriculum. The White Paper on Transformation of Higher Education (Republic of South Africa. Department of Education, 1997) stresses the challenge to redress past inequalities and to "transform the higher education system" to serve a new social order, to meet pressing needs, and to respond to new realities and opportunities. Institutions serving the higher education sector have a major role to play in providing the technological and business capability to underpin modern industrial and services development (Frain, 1992). Construction management education at South African Universities is delivered via either a co-operative learning programme or a full academic programme. This article presents findings of research into the views of employers and academics of value that experiential learning adds to the construction management programmes.

Keywords: co-operative education, experiential learning, research

Mr Ferdinand C Fester, Head of Department, Construction Management and Quantity Surveying. University of Johannesburg, South Africa. Tel:+27 11 4062162. Email: <ffester@twr.ac.za>

Dr Theo C Haupt, Research Coordinator, Faculty of Engineering. Cape Peninsula University of Technology, Cape Town, South Africa. Tel:+27 21 9596845. Email: <hauptt@pentech.ac.za>

Abstrak

Veranderings in akademiese leerplanne word hoofsaaklik deur beleid, die nywerheid en die akademie gedryf. In Suid-Afrika het beleidsrigtings 'n invloed op leerplan veranderings. Die Witskrif op Transformasie van Hoër Onderwys (Republic of South Africa. Department of Education,1997) het druk geplaas op die regstelling van ongelykhede en verandering in die hoër onderwysstelsels en om 'n nuwe maatskaplike bestel te reël deur aan vraagdruk, nuwe verwagtings en geleenthede uiting te gee. Van hoër onderriginstellings word verwag om 'n leidende rol te speel in die verskaffing van tegnologiese- en sakekundigheid om moderne sake- en nywerheidsontwikkeling te rig en te ondersteun (Frain, 1992). Konstruksiebestuuronderrig in Suid-Afrika word aangebied deur of meewerkende opleidingsprogramme of deur voltydse akademiese opleiding. Hierdie artikel poog om navorsingsbevindinge te gee oor hoe werkgewers en akademici voel oor die waarde van ervarings-opleiding in konstruksiebestuurprogramme.

Sleutelwoorde: ko-operatiewe onderrig, ervarings-opleiding, navorsing

1. Introduction

Academic curriculum change in the main is driven by policy, industry or faculty. In South Africa, several policy initiatives are directed at influencing changes to the curriculum. The White Paper on Transformation of Higher Education (Republic of South Africa. Department of Education, 1997) stresses the challenge to redress past inequalities and to 'transform the higher education system' to serve a new social order, to meet pressing needs, and to respond to new realities and opportunities. Institutions serving the higher education sector have a major role to play in providing the technological and business capability to underpin modern industrial and services development (Frain, 1992). Higher education reaches and trains people to fulfill specialised social functions, enter the learned professions, or pursue vocations in administration, trade, industry, science and technology and the arts (Republic of South Africa, Department of Education, 1997).

While maintaining the commitment to high academic standards, Higher Education Institutions (HEIs) also need to be committed to 'responding to the needs of industry' both in terms of course content and research. Further, higher education must provide education and training to develop the skills and innovations necessary for national development and successful participation in the global economy.

It is South African government policy that cooperative education should bridge the minds of students at higher education institutions and the industry in which they hope to develop their future careers. To achieve this national objective, institutions of higher education have to pursue strong relationships with, and input from the broadest range of stakeholders and industry concerning their fields of study. These industry-sensitive programs essentially have to help students in their transition from school to the work place.

In the South African higher education context co-operative education has been defined as the working together of industry and the education institution, in a process in which academic study is integrated with work experience in order to benefit both the students and industry (Council on Higher Education, 2002). In short, co-operative education refers to the integration of productive work into the career-focused academic curriculum (Haupt, Chileshe & Miller, 2005). Cooperative education thus needs to bridge the gap between education and training while enhancing the total educa-

tional experience of students to produce a graduate or diplomat that is both educated and trained and able to add value to the construction industry. This view of the cooperative approach suggests that both education and training are equally essential for a successful experience. Education according to Guillaud & Garnier (2001) refers to all the ways in which students train and develop to fulfil their potential realised as a result of acquiring skills, attitudes and values which not only reflect the need of the industry, but also the social, cultural and physical environment in which students live. On the other hand, training according to Haupt (2003) refers to the systematic development of attitudes, knowledge and skill patterns required by persons to adequately perform given tasks or jobs.

Many authors have argued that there should be an appropriate teaching approach that bridges the perceived gap between formal academic instruction and on the job training (Kim, Williams & Dattilo, 2002; Sanyal, 1991; Ellington, Gordon & Fowlie, 1998; Schaafsma, 1996). However, for some time academics and practitioners have recognised the need to balance the relationship between theory as taught in the classroom and practice in the field or industry (Ross & Elechi, 2002). This gap between what is taught in classrooms and what is needed in the workplace is well illustrated in Table 1 adapted from Cook & Cook (1998).

Table 1: Traditional education vs Workplace

	Traditional Education	*Workplace*
Requirements	Facts Individual effort Passing a test Achieving a grade Individual courses Receive information Teaching separate from learning	Problem solving Team skills Learning how to learn Continuous improvement Interdisciplinary knowledge Interact and process information Technology

(Adapted from Cook & Cook, 1998)

It is within this context that several have influenced curriculum design through initiating simulated 'world of work' practices and prompted the development of student centered learning approaches (Edward, 2004; Drahum & Lopez-Merono, 2004). There have also been several recent attempts at re-designing the learning environments (Eason, 2004; DeKereki, Azpiazu & Silva, 2004; Chinyino, 2004).

However, there are few studies, if any, and even less published research that evaluate the relationship between construction theory as taught in the classroom and construction practice in the field from a multi-stakeholder perspective *viz*. students, academic institutions and employers. This paper reports on the findings of a study conducted to assess multi-stakeholder perceptions of construction management education at Universities of Technology (formerly Technikons). In particular, it focuses on the experiential learning component of these programs and the views of academic staff and industry employers.

2. The Nature of Cooperative Education

Cooperative education is classified as Mode 2 knowledge in that it is characterised by the proliferation of knowledge production in the context of application, which is mostly problem-specific and guided by the requirements of practical relevance such as a specific industrial sector. This particular educational approach provides opportunities for students to have hands-on experience as part of their course of study (Haupt, Smallwood & Miller, 2004). In this way students are prepared for their future careers. They acquire valuable and specialised knowledge and skills by learning from experience and reflecting on that experience while becoming acquainted with the work processes (Hicks, 1996; Rainsbury *et al*., 1998). Workplace learning therefore provides the underpinning knowledge and attributes of competence needed for the job as a whole such as, for example, aspects of work-place culture, work norms and values (Gillen, 1993). This form of experiential learning may be expressed as the combination of three elements, namely programmed learning in structured settings, questioning learning gained via investigation and research, and own experience (Hicks, 1996).

Apart from co-operative education contributing to more effective learning (Schaafsma, 1996) it also has the potential to be mutually beneficial to both students and employers (Frain, 1992). Employers benefit from having a significant influence on course design and content by ensuring that industry-specific knowledge, awareness and values are integrated into the higher education process. Students benefit from working as they experience firsthand and come to understand the requirements of their chosen careers. As they engage in the actual activities in the workplace they gain appreciation for the challenges of their particular job (Ross & Elechi, 2002). They are consequently better able to make informed decisions on

their career choices. They also develop enhanced appreciation of concepts learnt in the classroom after applying knowledge in a professional setting (Gordon, Hage & McBride, 2001). This working or in-service period is often the students' first opportunity to apply theoretical, classroom-based knowledge in a practical work situation. They gain a more realistic view of how the world of work operates. Considering that work experience is often a strong determining factor in whether or not students find employment, co-operative education provides the opportunity for students to enhance their prospects of employment once they graduate (Frain, 1992). They are given the opportunity to demonstrate their abilities to prospective employers. Through this approach, they already have work experience at the moment of academic graduation. Students are introduced to the work ethic, and gain insight into the interpersonal skills needed to survive in the working world (Schaafsma, 1996). They see the opportunities for career development and personal growth that are open to them in their field of study.

In several studies employers noted that more opportunities for work placement during the students' courses would be beneficial and ease their transition into the workplace upon completion of their formal academic programs at HEIs. Spencer (1992) and Blakey (1992) cite the value of work experience for building students, and the CTM Standing Committee: Co-operative Education (2000) maintains that there are advantages of co-operative education for all the role players involved in experiential training. Although literature amplifies the importance of optimum experiential training/co-operative education, students neither gain meaningful practical experience, nor sufficient opportunity to apply their acquired knowledge during their experiential training year in industry while at the former technikons (Manthe & Smallwood, 2003a, 2003b). Over the last decade, it seems that ways of learning in higher education have been gradually getting closer to the needs and methods of the real world. However, studies have shown that there still is a mismatch between what construction employers appear to want and what higher education provides (Smallwood, 2002; Fester & Haupt, 2003).

3. Current University of Technology Instructional Model

In South Africa, University of Technologies (the former technikons) offers construction-related programs on the basis of cooperative education. The four-year Bachelor of Technology program is generally made up of three academic years spent full-time at the university with the second year spent full-time working in construction. Stu-

dents' complete projects in 2 or 3 subjects during this 'experiential year'. Students are also required to keep a logbook of all their work activities on a monthly basis. The logbook sets out the required activities that students are expected to experience. In order to return to the university to complete the remaining two years students have to obtain passing grades in each of these subjects as well as submit a duly completed logbook. Students may also be required to do an oral presentation of work completed during the experiential year.

4. Role of employers

Mentoring of the experiential learning student during the work-based period is vital. The advantages from this involvement of employers in work-based learning include:

- The link between theory and practice;
- Reinforcement of theory through practical experience;
- Increasing of students motivation and commitment;
- Increasing student employability once complete with academic study; and
- Employers being able to recruit staff familiar with the organisations culture (Taylor, 2001).

The reasons why employers feel reluctant to implement such strategies include:

- The belief that they do not have the time to plan and review training;
- Uncertainty with regard to responsibility to support students;
- Not understanding the link between academic and work-based learning;
- Tight budgets;
- Lack of understanding of the commercial reward of education and training; and
- Belief that students demands may conflict with those of other employees (Taylor, 2001).

In order for any construction organisation to be truly able to participate in work-based learning the argument may be made that such entity have in their employ suitably qualified and experienced persons who will add value to the experience

5. Research methodology

This study draws on the views and insights of the three partners in the co-operative model obtained through multiple survey instruments of multiple samples, namely the students, academic staff who address the predominantly theoretical aspects of construction management and industry employers who had actually employed students during and after their experiential learning periods as shown in Table 2. In this paper only the views of academic staff and employers are reported on.

Table 2: Total Sample by Participation

Stakeholder	*Sample size*
Academic staff	30
Students[1]	348
Industry employers	60
Total	438

The largest group of participants was students, namely first year (162) and third and fourth years (186). This is not surprising since the research team had more ready access to students than to the other participants in co-operative education. Industry participants were invited to participate in the survey on an 'Interview Basis.' However, those unable to make time for the interview were called by telephone, faxed the questionnaire and informed that they would be called to do the interview by telephone. Only as a last resort were participants permitted to self-complete the questionnaire. With all the measures undertaken, the desired sample as shown in Table 2 was achieved. These samples were considered representative of the three collaborative partners.

5.1 Data Collection

The survey instruments used in this study comprised of various sections. Several questions required 5-point Likert-scaled responses where respondents were asked to rate their levels of agreement or importance relative to various issues being investigated. Qualitative answers were also sought from the respondents in order to qualify their responses and provide deeper and richer meaning.

[1] This article only focuses on the views of academic staff and industry employers

5.2 Data Analysis

The survey instrument comprised of five sections as shown in Figure 1. A total of four dimensions of educational offerings and experiential training within South Africa were perceptualised and measured using the 5-point Likert-scale. For example in section A that deals with experiential training the focus of this paper, respondents were asked to respond to 11 statements relative to what method should be used for assessing experiential training where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

Once the questionnaires were returned the responses were electronically captured using the Software Package for Social Sciences (SPSS). The mean values and the valid percentages were used to present the analysed data.

Views on the following aspects of experiential learning (EL) were sought from academic staff and industry employers:

- The necessity of experiential learning;
- The basis of experiential learning;
- The preferred nature of experiential learning;
- Whether or not experiential learning should be assessed;
- The preferred agency of assessment of experiential learning;
- Whether or not experiential learning should be undertaken in stages;
- The timing of experiential learning; and
- Whether or not experiential learning should be remunerated.

5.3 Profile of samples

The employer sample comprised of general contractors (48.9%), project management practices (17.8%), quantity surveying practices (15.6%), consulting engineers (4.4%) and co-contractors (2.2%). They operated largely in the Gauteng (30.0%) and Western Cape provinces (24.0%). More than half (51.1%) had annual turnovers exceeding R20 million with 20.7% having turnovers between R1 million and R5 million. The average reported size of their labour force was as follows:

- < 10 employees (22.4%);
- Between 11 and 50 employees, (20.4%); and
- > 250 employees (24.5%).

All academic staff surveyed were employed at universities of technology (former technikons). Most of the academic staff (53.6%) surveyed were not professionally registered while 57.1% were involved with some aspect of construction industry related research.

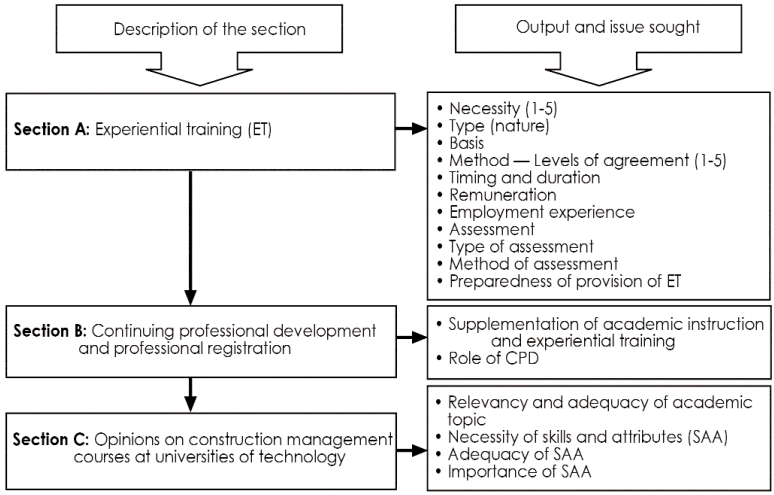

Figure 1: Structure of survey instrument

6. Necessity and nature of experiential training

Most academic staff (96.7%) regarded experiential training either as a necessary (30.0%) or totally necessary (66.7%) component of construction management programs. Similarly, most employers (96.5%) considered experiential training to be either necessary (24.1%) or totally necessary (72.4%), confirming the findings of previous studies conducted by Haupt, Smallwood & Miller (2004) and Fester & Haupt (2003). With respect to whether this experiential training should be project based or function/department based where students worked in the various departments of the employing organization, both employers (68.3%) and academics (53.3%) preferred a combination of both. This experiential component was one jointly devel-

oped by the institution and employer together with guidelines on what the student was expected to do during the period spent in industry. On the other hand, an unstructured programme left the onus upon the employer to train the experiential learning student in general construction matters. Academic staff (86.7%) and employers (82.5%) preferred experiential learning to be structured and that it should be assessed, namely 93.3% and 89.7% respectively.

6.1 Methods of assessment

The responses ranked by means relative to preference for the method of assessment are shown in Table 3 and suggest differences in preferences. While academics preferred term reports and rating sheets, employers preferred continuous and project based assessment. There was congruence on the preference for competency based assessment. There was a degree of congruence relative to the least preferred methods of assessment, namely peer and panel assessments.

Table 3: Assessment Methods

Employers			*Assessment method*	*Academic staff*			
Rank	*Mean*[2]	*Std. Dev.*		*Rank*	*Mean*[3]	*Std. Dev.*	*CV*
4	1.52	0.50	Term report method	1	4.48	0.80	17.86
4	1.52	0.50	Rating sheet	2	4.33	1.00	23.09
3	1.48	0.50	Competency based assessment	3	4.07	0.83	20.39
1	1.43	0.50	Continuous assessment	4	4.04	0.88	21.78
2	1.46	0.50	Project based assessment	5	3.96	0.94	23.73
8	1.67	0.48	Job sponsor assessment	6	3.81	1.10	28.87
8	1.67	0.48	Portfolio assessment	7	3.76	0.93	24.73
6	1.56	0.50	Observation method	8	3.52	1.16	32.95
11	1.83	0.38	Panel assessment	9	3.31	1.23	37.16
7	1.65	0.48	Self-assessment method	10	3.00	1.44	48.00
10	1.76	0.43	Peer assessment	11	2.70	1.44	53.33

[2] The closer the mean is to 1 the more positive the preference for the assessment method.

[3] The closer the mean is to 5 the more preferential the assessment method on the 5-point Likert-scale of preference.

6.2 Agency of assessment

The most preferred agency to assess the experiential component according to both samples was the employer followed by the academic institution as evidenced from Table 4. Employers did not rate students and the combination of students, employers and academic institutions as assessment agencies.

Table 4: Assessment Agency

Employers			*Agency*	*Academic staff*		
Rank	*Mean*[4]	*Std. Dev.*		*Rank*	*Mean*[5]	*Std. Dev.*
1	1.25	0.44	Employer	1	4.16	1.11
2	1.30	0.46	Academic institution	2	4.15	1.17
			Academic institution, employer & student together	3	4.12	1.03
3	1.79	0.41	Independent assessor	4	2.96	1.37
			Student	5	1.83	0.89

6.3 Duration and location of experiential learning

Similarly, most academics (80.0%) and employers (78.9%) preferred experiential learning to be undertaken in stages with most suggesting that the total period of time should be either 12 months, namely 77.8% and 63.6% respectively or 6 months, namely 70.0% and 34.1% respectively. Table 5 provides an indication of preferences for the location of experiential training within the academic program of construction management students. Evidently, academics and employers have differing preferences on this issue. Employers prefer industrial experience to take place after two years at the university while academics prefer a period after year 1. Employers preferred this period to occur after completed years at university while academics had some preference for during the academic year.

[4] The closer the mean is to 1 the more positive the preference for the timing of EL.

[5] The closer the mean is to 5 the more preferential the assessment agency on the 5-point Likert-scale of preference.

Table 5: Location of Experiential Training within Academic Program

Employers			*Timing of experiential learning*	*Academic staff*			
Rank	*Mean*[6]	*Std. Dev.*		*Rank*	*Mean*[7]	*Std. Dev.*	*CV*
2	1.29	0.46	After year 1	1	4.09	1.24	30.32
4	1.39	0.50	During year 2	2	3.45	1.53	44.37
6	1.53	0.51	Durig year 3	3	3.00	1.73	57.67
5	1.52	0.51	During year 1	4	2.80	1.54	55.00
1	1.20	0.41	After year 2	5	2.80	1.40	50.00
3	1.33	0.58	After year 3	6	2.41	1.42	58.92

Relative to how adequately employers were equipped to mentor students during their experiential period in industry the mean response of academics was 3.17 (out of maximum of 5). They reported a mean response of 3.43 relative to how adequately the experiential learning experience of students satisfied their requirements. Employers' views on these issues were not canvassed in the survey.

6.4 Forums of influence

Table 6 provides an indication of the effectiveness of various forums to influence construction management programs at universities of technology. Of the three forums, influencing bodies such as regional Master Builders Associations (MBAs), Construction Education and Training Authority (CETA) and others were the most preferred while lobbying education authorities was the least preferred. Academic staff felt more strongly than employers about the potential of external agencies to influence construction programs.

Table 6: Forums of Influence

Employers			*Academic staff*	
Mean	*Std. Dev.*		*Mean*	*Std. Dev.*
2.33	0.68	Influencing bodies such as regional MBAs, CETAs and others	2.36	0.64
2.19	0.73	Serving on advisory councils or boards of universities of technology departments	2.28	0.74
1.88	0.60	Lobbying appropriate education authorities	2.17	0.72

[6] The closer the mean is to 1 the more positive the preference for the assessment agency.

[7] The closer the mean is to 5 the more preferential the timing of EL on the 5-point Likert-scale of preference.

6.5 Remuneration of experiential learning

Most employers (67.2%) were prepared to offer experiential learning opportunities to students with remuneration, whereas 15.5% were not.

6.6 Adequacy of employers to mentor experiential learning

The responses of academics about the adequacy of employers to mentor experiential learning to educator's requirements are shown in Table 7. Evidently, academics felt that employers demonstrated slightly above average adequacy to mentor students during their period in industry. They felt that employers offered students an above average industrial learning experience.

Table 7: Adequacy of mentoring and of experiential learning

Response	*Mean*	*Std. Dev.*
Adequacy of employer to mentor	3.17	0.99
Adequacy of EL experience to educators' requirements	3.43	1.01

7. Conclusion and recommendation

The experiential learning period is an important part of construction management program given that it bridges the gap between the practical and theoretical aspects of the program. It also offers employers an opportunity to influence the learning content by exposing the student to actual working conditions.

In order to meet the requirements of the industry while at the same time contributing to national development and participation in the global economy, the following recommendations are suggested:

- All construction management programs at HEIs include a mandatory period of experiential training for all students;
- Experiential training to be conducted in stages preferably with a minimum total duration of 12 months;
- This assessed experiential training period involving both employers and academics should be structured; and
- Experiential training should include both project based and function/department based elements.

Given that the study found that employers and academics should be involved in the assessment of the experiential learning component of construction management programs, mutually acceptable means of assessment need to be developed that include combinations of continuous, competency and project based assessments. Further, considering the differences expressed about where this experiential period should be located within the academic program, employers and academics need to find common ground relative to timing. However, there is endorsement that there should be such a component in construction management programs. Additionally, a guide defining the roles and responsibilities of employers in mentoring students during their time in industry needs to be negotiated and developed to ensure improved mentoring. A scale of remuneration of students while working in industry needs to be developed consultatively to ensure uniformity throughout the construction sector.

It is important to include external industry forums and stakeholders in the process of shaping construction management programs that fit the demands of the national and global economies.

It is recommended that in developing the revised curriculum, the learning outcomes of each subject offered within the Construction Management program can be written with the inclusion of the following four areas namely, objectives, subject knowledge, discipline (specific) and competencies. For example, the issue of competencies can be addressed in terms of what a graduate can do as a result of the degree programme, including the narrower notion of occupational competence.

Consideration should be given to the introduction of a module or subject called 'Reflection on Experiential Training' which would facilitate comparisons and reflections on the knowledge and skills acquired in the classroom and the application of these in the workplace. In this way the language of competences would have similarities to the language of academic learning outcomes. As part of the cooperative assessment process, construction management students could be expected to provide a 'Portfolio of Evidence' covering the required learning outcomes and/or competences.

Other observations to improve the present model of delivery include:

- Preparation for multidisciplinary practice;
- Strengthening specialist skills;

- Promoting integrative professionalism with international competitiveness; and
- Designing university curricula in collaboration with industry which can take the following formats:
    - o Direct industry/academic collaboration;
    - o Student industrial placement with an agreed basis of innovative remuneration; and
    - o Student mentoring scheme with senior consulting profes sionals from industry to improve the present poor industrial experience of students.

The timing of the experiential learning period is contentious in that employers prefer a period after the second year of study while academics prefer this period after the first year of study. Currently the experiential learning period is being offered after the first year of study although this is contrary to the NATED 151 document (Department of Education, 2004) which places experiential learning after 18 months of study.

A model that acknowledges the equal cooperative contribution of the three partners, namely students, academic staff, and industry is the way forward. However, a careful investigation is required as to what extent the industry should take ownership of what is taught, even though equality in collaborative terms is being advocated.

If Universities of Technology are to offer a full contribution to educating the built environment consulting professionals, they should take a more proactive role in offering a multidisciplinary, continuous professional education not based or limited to the standard curricula, hence the need for constant revision.

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