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The *status quo* of green-building education in South Africa

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Abstract

There is countrywide a lack of relevant and necessary professional and tertiary institutions offering education and training in green building in South Africa. This causes a lack of awareness, knowledge and skill in green-building principles, which directly results in a lack in the introduction and implementation thereof on projects in the property-development industry.

The purpose of this study was to determine whether tertiary institutions have started to incorporate green-building programmes and/or modules in current curricula. A literature review on green-building education, not only at academic institutions, but also at property industry educators was done to develop a questionnaire for reflecting the *status quo* of green-building education programmes at built-environment departments of six South African universities. These departments included quantity surveying and construction management; architecture; quantity surveying, construction management, and urban planning.

The intention of this article was not to investigate curriculum renewal/innovation, but merely to examine the *status quo* of green-building education currently offered by tertiary and professional institutions in South Africa.

Based on the findings, green-building education at built-environment departments of academic institutions in South Africa is lagging behind, and progress seems to be slow. There are, however, signs indicating that positive changes are being made to introduce and implement green-building education.

Keywords: Green building, construction, education, South Africa

Abstrak

Daar is landwyd 'n tekort aan relevante en nodige professionele en tersiêre onderrig en opleiding in groenbou in Suid-Afrika. Dit veroorsaak 'n gebrek aan bewustheid, kennis en vaardigheid in groenbou-beginsels, wat lei tot 'n gebrek aan die voorstelling en implementering daarvan op projekte in die eiendomsonwikkelingsindustrie.

Die doel van hierdie studie was om te bepaal of tersiêre instellings al begin het om groenbou-programme en/of modules aan te bied as deel van hul huidige kurikulum. 'n Literatuuroorsig oor groenbou-onderrig, nie net ten opsigte van

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akademiese instellings nie, maar ook onderrig in die eiendomsbedryf, is gedoen om 'n vraelys te ontwikkel wat die *status quo* van groenbou-onderrigprogramme in bou-omgewing departemente van ses Suid-Afrikaanse universiteite te weerspieël. Hierdie departemente sluit bourekenkunde en konstruksiebestuur; argitektuur; bourekenkunde, konstruksiebestuur en stedelike beplanning in.

Die bedoeling van hierdie artikel was nie om kurrikulum hernuwing/innovasie na te vors nie, maar om die *status quo* ten opsigte van groenbou-onderrig wat tans deur tersiêre en professionele instellings in Suid-Afrika aangebied word, te ondersoek.

Die resultate toon dat groenbou-onderwys aan bou-omgewing departemente van akademiese instellings in Suid-Afrika agter is en vordering blyk stadig te wees. Daar is egter tekens wat aandui dat positiewe veranderinge gemaak word om groenbou- en volhoubaarheidsonderrig te implementeer.

Sleutelwoorde: Groenbou, konstruksie, onderrig, Suid-Afrika

1. Introduction

Lack of education is often cited as a major barrier to implementing green design (Carlisle, Brown, Foster, Bennett & Sandler, 2004: 32; Landman, 1999: 29; Shafii, Ali & Othman, 2006: 41). Elforgani & Rahmat (2010: 964) stated that one of the major barriers in green building is the lack of green-design knowledge that decision-makers exhibit throughout the construction process. In addition, Landman (1999: 29) revealed in her study that 84% of the building professionals surveyed indicated that members of their project teams often do not have adequate technical understanding of sustainable building methods. Bond & Perrett (2012: 53), Cattano (2010: 29) and Shari & Soebarto (2012: 6) indicated that a lack of knowledge and experienced workforce hinders the implementation of green-building practices.

Hankinson & Breytenbach's (2012: 5) study revealed that education and inexperience in sustainable design posed a barrier in green building in South Africa. Fifty per cent of the participants (interior designers and architects) stated that sustainable design was not studied, whereas they were at a Technical University or University in South Africa. The commercial building sector in South Africa is hampered by the lack of professional education in green building (Milne, 2012: 107, 126). Time delays occur due to lack of knowledge and skills in green-building construction. In Landman's (1999: 29) study, respondents stated the following: "We tend to spend a lot of extra time training project participants in the use of sustainable strategies in construction."

According to the Industrial Labour Organisation (ILO) (2011: 89), it is often difficult for providers of training and education to respond to the demand for skills in green building. Implementing an education or training course can take several years. Course development

requires time and effort, and expectations of prospective students and trainees may constrain a new course. All of this makes it difficult for providers of training and education to respond to demand for skills in green building as promptly as role players in the green-building sector might prefer.

It is important to examine the *status quo* of green-building education in South Africa. This assessment will not only reflect the shortcomings of green-building education at higher education institutions in South Africa, but also emphasize the importance of professional industry education. In the context of sustainability, education is critical because of promotion, awareness and capacity development (Fien & Tilbury, 2008: online).

An examination of education's role in the *status quo* of green building in South Africa, as well as whether tertiary education institutions started to incorporate green-building programmes/modules as part of their education portfolio may fill the void in understanding why sustainability and green-building practices are not sufficiently integrated into tertiary level curricula in South Africa. Significant efforts from multiple stakeholders in academia, industry and public sector may be required to improve the situation.

1.1 Problem statement

What is the *status quo* of green-building education in South Africa? Is there evidence to suggest that South Africa is moving toward a sustainable future in the context of built-environment education?

1.2 Research questions

Does education play a role in the *status quo* of green building in South Africa? Have tertiary education institutions started to incorporate green-building programmes and/or modules as part of their education portfolio?

1.3 Hypothesis

There is little evidence to suggest that South Africa is moving toward a sustainable future in the context of the built environment. Progress in terms of green-building development in South Africa is slow or non-existent. A lack of green-building education at tertiary institutions contributes to this unfortunate phenomenon.

1.4 Purpose

To examine the contribution of education toward the *status quo* of green-building development in South Africa and to determine whether tertiary institutions have started to incorporate green-building programmes/modules as part of their education portfolio. The purpose was not to investigate the various curriculums offered by tertiary institutions nor to make suggestions in terms of re-curriculation.

1.5 Methodology

A literature study sets the context for green building in South Africa. Material drawn from various sources is presented – journals, books, professional publications, reports relating to industry drivers such as the Green Building Council of South Africa (GUCCI), and refereed articles. The literature study was used as a knowledge base for the empirical study.

Quantitative research follows the literature review, which involves an inductive research process and includes the collection and analysis of quantitative data to identify statistical relations of variables. Data for the study was collected by means of a structured questionnaire pertaining to green-building education. Questionnaires were designed to test the hypothesis, and the questions were based on the literature reviewed. The questionnaires measure variables pertaining to awareness, knowledge and education of green building in the built environment in South Africa.

The data was processed, using Microsoft Excel spreadsheets. The statistical information was interpreted and analysed, and the findings are presented in tabular form.

2. Education

Globally, there seems to be agreement that education has a significant role to play in the motivation and empowerment of people in order to make positive changes towards more sustainable lifestyles (Fien & Tilbury, 2008: online; Nevin, 2008: 50; Witthaus, McCandless & Lambert, 2010: 8). The impact of investment in green building may, however, be profound. Education seems to be one of the most important investments a country could make in its people and its future and seems critical in the process of increasing awareness regarding the negative effects of buildings on the planet. It has also been argued that educators have a substantial role to play in the process of making extensive social changes that are necessary for

sustainable development (Fien & Tilbury, 2008: online; Khan, 2013: 10; Cotgrave & Alkhaddar, 2006: 8).

According to Lee (2007: online), the driving force for improvements in sustainability comes from added knowledge and improved technologies, as well as the transformation of value systems through the process of education. In order to succeed in the quest towards sustainable development, the necessary values and skills should be integrated into the various levels of education. It is, therefore, important that the roles and responsibilities of higher education institutions, green building and sustainable research development, as well as property-industry educators should not be underestimated (Hogan & Tormey, 2008: 10; Jones, Trier & Richards, 2008: 341-342).

2.1 Tertiary level institutions

The trend in both developed and emerging countries, as well as in emerging countries such as India and China is for green-building practices to be integrated into tertiary level curricula of applied built-environment disciplines (Ryan, Tilbury, Corcoran, Abe & Nomura, 2010: 107). The United Nations (UN) has constituted 2005-2014 as the decade for educational sustainable development. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has identified four main goals in order to achieve this, of which the second addresses education: "reorienting educational programs". For academic institutions, this means reviews of existing curricula towards sustainability, and mandated approaches to teaching, learning and assessment (UNESCO, 2006: 5). Milne (2012: 107, 126) notes that the lack of knowledge and skills experienced in terms of sustainability among built-environment practitioners may be traced back to the education offered at academic institutions.

Edwards & Naboni (2013: 48) also note an increase in programmes and development courses aimed at improving training and education in environmental design and practices. A major barrier to the changing process, however, seems to be a lack of qualified educators, as well as a conservative approach of some organisations and the long administrative process required to implement new courses.

Educators are agents who constitute a powerful start in an effort to modernise curricula in order to embed contemporary issues of sustainability (El-Deghaidy, 2012: 24; Gorgolewski, 2010: 34). It is, however, true that knowledge and experience gained by young graduates are not transferred to the older employees, who have established their own methods of working and appear to be conservative with new ideas (Edwards & Naboni, 2013: 48).

Changing attitude towards sustainability derives in part from formal construction-education curricula at tertiary level institutions, which integrate the concept of sustainability (Ahn & Kwon, 2008: 4; Cotgrave & Alkhaddar, 2006: 4-5; Zhang, Zimmerman, Mihelcic & Vanasupa, 2008: 3-4). Therefore, it appears that higher education institutions (HEIs) are under pressure to change the focus of education in order to accommodate the needs of sustainable practices. Tertiary level institutions should model sustainable practises, as stated in the United Nations Global Compact (UN, 2011: 7): "It is therefore important that academics and institutions keep experimenting with, and sharing their efforts to embody sustainability, especially in making it a focus of their disciplines and professions in the process of curriculum design, development and research."

Higher education institutions bear a responsibility to address the demand for environmental issues. It is imperative that construction programmes start including green-education courses into their curricula (Cortese, 2003: 16; Mead, 2001: 168). Only then will graduates be prepared for the future and be able to make a positive difference to the environment (Tinker & Burt, 2003: 117; Ahn, Kwon & Pearce, 2009: CD-ROM).

A positive development from the South African Council for the Architectural Professionals is its expression of commitment to ensure that green-building theory and strategy are included in architectural curricula at tertiary institutions (Frost & Sullivan, 2013: online).

2.2 Green-building research at tertiary education institutions

In order for the green-building movement to grow and move forward, it is crucial that green-building research be promoted and conducted and that the findings be shared and distributed at conferences and in peer-reviewed journals (Ashworth & Perera, 2013: online; Blismas, McCoy & Lingard, 2009: 483). Printed or online educational materials such as journals and conference proceedings are commonly used, have a relatively low cost, and are generally feasible in the majority of cases (Grimshaw, Eccles, Lavis, Hill & Squires, 2012: 5).

It is important to maintain standards and provide credibility through such conferences and journals, by upholding and employing the culture of 'peer review'. There seems to be a lack of rigour in the scientific methodology used in some journals, thus increasing the need for quality information and findings on performance benchmarks. In addition to this, it requires considerable effort to screen and filter through information available; this reduces time spent on the practical side of business. There is increasing pressure

for practitioners to develop critical research skills in order to work through the enormous amount of information and technical data (Edwards & Naboni, 2013: 49).

Dissemination and translation of research findings on the key issues of green building and sustainability is necessary in order to educate policy-makers towards policy change on implementing green-building and sustainable strategies (McGranaghan & Kauper-Brown, [n.d.]: online). Research papers from academics were often produced without any link with practice and often made hardly any contribution to the construction industry, leading to many of the large quantity-surveying practices recognise that there is a general lack of research in the built environment (Ashworth & Perera, 2015: 232). Relationships between academia and the industry are very valuable for the translation of research into industry practice (Blismas *et al.*, 2009: 482). Academics and researchers must involve the industry in the research process by making use of industry as a base for their information and data (Blismas *et al.*, 2009: 483). This coordinated 'unity of effort' is the key to implement and evaluate innovations through applied field-based research and to disseminate research findings and development in the construction industry (Blismas *et al.*, 2009: 489).

2.3 Professional industry educators

Roux (2013: 23) comments on the poor industry knowledge and skills shortage in South Africa. Milne (2012: 107) notes that there remain a lack of understanding of sustainability principles and knowledge of green-building practices at many levels of the property industry, including owners, architects and contractors. A study done among sustainable design practices within the KwaZulu-Natal region by Hankinson and Breytenbach in 2012 revealed that inexperience with sustainable design projects was a barrier to the implementation of sustainable design in South Africa. The study showed that there are not enough clients or projects that allow designers to gain much needed experience in sustainable design. For this reason, the majority of the participants discussed feeling somewhat "new" and inexperienced in the practice thereof (Hankinson & Breytenbach, 2012: 5).

2.3.1 Green Building Council of South Africa

Milne (2012: 126) states that professional education will enhance the current industry's green-building knowledge and awareness and help improve the lack of skills presently experienced in South Africa.

The Green Building Council of South Africa (GBCSA) is the facilitator of independent conferences, courses and seminars. However, it is crucial that this information be transcended into universities and technical universities in order to provide a basis of understanding for students. Industry education is one of the focus areas of the GBCSA. The number of people enrolling in the various courses and programmes offered by the GBCSA, including the Green Star SA Accredited Professional training programme, is a reflection of the thirst and desire of the property and construction industry to gain and improve green-building knowledge (Milne, 2012: 107).

Courses and programmes offered by the GBCSA include online courses, face-to-face workshops, and full Green Star SA Accredited Professional programmes, including online examinations in the following areas: new buildings; interior, and existing buildings performance (GBCSA, 2015: online).

As the property industry educator, the GBCSA is experiencing the following challenges:

- There is a shortage of relevant local green-building research data and a limited number of green-rated buildings;
- There is a lack of appropriate, specifically tailored offerings from basic, introductory courses to more advanced, detailed and technical sessions, and
- The body of knowledge about sustainability and green buildings is changing fast and is constantly being added to (Milne, 2012: 107).

3. Research methodology

This empirical research project focused on built-environment departments at various universities in South Africa. Personnel responsible for coordinating the programmes at these departments reported on the *status quo* of green-building education in South African tertiary institutions. Structured survey questionnaire invitations were sent via e-mail. For this investigation, an e-mail distribution method offered the opportunity to collect data across all South African tertiary institutions that participated in the research project.

3.1 Sampling method

An online information search identified 11 South African universities that offered programmes in construction and the built environment, namely Cape Peninsula University of Technology, University of Cape Town, Nelson Mandela Metropolitan University, Tshwane

University of Technology, University of Johannesburg, University of Pretoria, University of the Witwatersrand, Durban University of Technology, Central University of Technology, University of the Free State, and Water Sisulu University.

Of these 11 institutions, only six were willing to participate in the research. Of these six universities, the programme coordinators of fifteen built-environment departments were requested to complete the questionnaire. The discipline/profession taught by these departments included Quantity Surveying and Construction Management (3), Architecture (2), Quantity Surveying (1), Construction Management (1), and Urban Planning (1).

3.2 Sample size

The sample size for construction-related professionals was calculated in accordance with the table recommended by Krejcie & Morgan (1970: 608). The table gives recommended sample sizes for general research activities, applicable to any defined population. From the table, the recommended sample size for a population of 15 is 14, for 20 it is 19, and for 25 it is 24. This recommendation does not validate the sample size of six as efficient for the population of 11, but can be validated against the fact that there are a limited number of built-environment departments at South African universities willing to participate in this study.

3.3 Data collection

A structured questionnaire was distributed electronically via email to a total selected sample of 15 programme coordinators at built-environment departments of six universities¹ in South Africa.

The respondents were asked to indicate the discipline/profession taught by the department represented. A confidentiality statement was included with the questionnaires and anonymity was ensured.

Participation in the study was voluntary. Respondents were not requested to provide any demographical information regarding themselves, due to the fact that each respondent represents a built-environment department at a tertiary education institution and the responses reflect the information regarding programme(s)/modules and not the opinions or knowledge of the respondents. Questions relating to the age, discipline, experience and qualification of the respondent have, therefore, been excluded.

1 Based on the confidentiality agreement between the researchers and the higher level of tertiary institutions, these institutions' names may not be disclosed.

After two weeks of distribution, the importance of the research was communicated to the potential respondents via telephone in an attempt to improve the response rate. The topics of the green-building education programmes used in the questionnaire were extracted from reviews of the literature. This resulted in the formulation of a questionnaire divided into nine questions pertaining to the teaching and education of green and sustainable practices at higher education institutions in the built environment.

To reduce the respondents' bias, closed-ended questions were preferred (Akintoye & Main, 2007: 601).

3.4 Response rate

Eight responses were received from the selected group of 15 built-environment departments, reflecting a 53% response rate. According to Moyo & Crafford (2010: 68), contemporary built-environment survey response rates range from 7% to 40% in general.

3.5 Data analysis and interpretation of findings

The questionnaire includes questions pertaining to green-building education at South African universities. 'Yes'/'No' questions and open-ended questions were used in the formulation of the questionnaire. Excel spreadsheets were used to process the responses. The statistical information was interpreted and analysed, and the findings were presented in tabular form.

3.6 Limitations

This study is limited to six South African universities that were willing to participate in this study. Due to the nature of the topic and the infancy of green building in South Africa, the majority of the literature reviewed consists of international publications and information. The empirical research, however, does not include the international built environment, but has been limited to the South African context.

3.7 Terminology

For the purpose of this article, it is important to clarify terminology in order to avoid any confusion or misinterpretation of the purpose/intention of the study.

3.7.1 Modules offered at built-environment departments

According to Wordreference.com (2010-2015: online), an online dictionary, [a] module is a self-contained course that usually lasts for one term. It covers one subject and is assessed independently of other modules. In order to gain a qualification one must collect passes in some predetermined number of modules".

3.7.2 Programmes offered at built-environment departments

Academic programmes comprise the core, required and elective modules that lead to a degree. All students pursuing a graduate degree at a large university will be enrolled in an academic programme (Learn.org, 2003-2015: online).

According to the University of Arkansas (n.d.: online), a programme of study is defined by sets of academic requirements that result in a degree, which a university is authorised to offer. Degree-programme requirements are typically stated in terms of numbers of credit hours and specific modules to be completed. Examples are Bachelor degrees, Master degrees and Doctor of Philosophy degrees.

4. Results and findings

4.1 Respondents' profile

Respondents were not requested to provide any demographic information regarding themselves, due to the fact that each respondent represents a built-environment department at a tertiary education institution and the responses reflect the physical content of an educational programme and not the opinions or knowledge of the respondents. Questions relating to the age, discipline, experience and qualification of the respondents have, therefore, been excluded.

Table 1 reflects the composition of the various built-environment disciplines/professions represented by the departments. Column 1 indicates the different disciplines represented; columns 2 and 3 reflect the amount and percentage of respondents per discipline, and column 4 shows the ranking of the groups represented.

Table 1: The composition of departments in terms of the disciplines represented

<i>Discipline</i>	<i>Respondents</i>	<i>Percentage</i>	<i>Ranking</i>
Quantity Surveying and Construction Management	3	38	1
Architecture	2	25	2
Quantity Surveying	1	12.5	3
Construction Management	1	12.5	3
Urban Planning	1	12.5	3
Total	8	100	

The majority (63%) of the departments represented teach Quantity Surveying and/or Construction Management as a profession. The balance of the respondents represents Architecture (25%) and Urban Planning (12.5%).

4.2 Programmes² at built-environment departments

4.2.1 Green-building or sustainability programmes at built-environment departments

The purpose of question 1 was to determine whether built-environment departments at tertiary education institutions in South Africa have started to introduce and implement green-building or sustainability programmes³ as part of their education portfolio. Table 2 reflects the departments that are offering green or sustainable programme(s) as part of their education portfolio. The data in Table 2 shows the 'Yes'/'No' responses to the question posed.

Table 2: Departments offering green-building or sustainability programme(s)

<i>Responses</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Number of respondents	3	5	8
Percentage of total	37.50	62.50	100

2 See clarification in subheading 3.7.2.

3 The intention and focus of the study was not to investigate detailed specifications of programmes/qualifications currently offered by the departments represented.

Table 2 indicates that the majority of built-environment departments at South African universities do not offer green-building or sustainability programme(s). The result of this question may suggest that built-environment departments at tertiary education institutions are slow to incorporate green-building education and that students, therefore, do not have a wide selection of programmes in green building or sustainability across the country to choose from when selecting a future career path.

4.2.2 Degree levels of green-building or sustainability programmes offered at built-environment departments

Question 2 asks the respondents to indicate the degree level of the green or sustainable programme if the answer to question 1 was 'Yes'. The purpose of this question was to determine the level of the green-building or sustainability programmes offered at the departments represented.

As is evident in Table 2, three respondents indicated that a green building or sustainable programme is offered at the department represented. They also indicated the degree level of the programme mentioned, as reflected in Table 3.

Table 3: Degree level of green or sustainable programmes offered at built-environment departments

Responses	Basic	Honours	Masters	Doctorate	Other	Total
Number of respondents	1	1	1			3
Percentage of total	33.30	33.30	33.30			100

Each of the three departments that offer green-building programmes present the programme at a different level. One programme is offered at undergraduate level, one at Honours level, and one at Masters level. The responses indicate that students only have one option in each degree level to select from across the country when choosing a profession or future career path. The options available are limited, and students are forced to choose a programme from a specific university without the option of considering the location, language, or culture of the institution.

Table 3 reflects that green-building education in South Africa is in its infant stage and is slow in terms of growth and continued development.

4.3 Modules⁴ offered at built-environment departments

4.3.1 Green-building or sustainability modules offered at built-environment departments

The purpose of question 3 was to determine whether built-environment departments at tertiary education institutions in South Africa have started to introduce and implement green-building or sustainability modules⁵ as part of their programme curriculum. Table 4 reflects the number of departments that are offering green or sustainable module(s) in a curriculum. The data in Table 4 shows the 'Yes'/'No' responses to the question posed.

Table 4: Departments offering a green-building or sustainability module/modules

Responses	Yes	No	Total
Number of respondents	5	3	8
Percentage of total	62.50	37.50	100

Table 4 indicates that 62.50% of the participating eight built-environment departments at South African universities offer a green-building or sustainability module. The literature review indicates that built-environment programmes at tertiary education institutions should offer a broad scientific curriculum, including specific modules encompassing green building and sustainability. The literature study also highlighted the demand in the market for professionals with sustainability and green-building knowledge and skills. The result of this question indicates that there is progress in terms of green-building education in South Africa. It may be argued that built-environment departments at tertiary education institutions are realising the importance of green building and the teaching thereof to future built-environment practitioners.

4 See clarification under 3.7.1.

5 The intention and focus of the study was not to investigate detailed specifications of modules currently offered by the departments represented.

4.3.2 Degree levels of green-building or sustainability modules offered at built-environment departments

Question 4 asks the respondents to indicate the degree level of the green or sustainable module if the answer to question 3 was 'Yes'. The focus of this question was to determine the level of the green-building or sustainability modules offered at the departments represented. As shown in Table 4, five respondents indicated that a green-building or sustainable module is offered at the department represented. These five respondents also indicated the degree level of the modules, as reflected in Table 5.

Table 5: Degree level of green or sustainable modules offered at built-environment departments

<i>Responses</i>	<i>Basic</i>	<i>Honours</i>	<i>Masters</i>	<i>Doctorate</i>	<i>Other</i>	<i>Total</i>
Number of respondents	2	3				5
Percentage of total	40	60				100

Two of the five departments that indicated that they offer green-building modules offer modules at undergraduate level; three of them offer modules at Honours level. The responses indicate that students, who consider green building and sustainability to be an important aspect of their education, have limited options when selecting an institution for tertiary education in the built environment. Table 5 reflects that green-building education in South Africa is slow in terms of growth and continued development. It may be argued that fundamental changes will have to be made at tertiary education institutions in order for South Africa to raise knowledge and awareness in this very important field.

4.6 Future inclusion of green or sustainability programmes/modules in built-environment education portfolios

Question 5 relates to whether the departments represented, that do not currently offer green-building programmes or modules, are planning to do so in the future. Table 6 reflects the intentions of these departments to incorporate green building or sustainability content in the future. The data in Table 6 shows the amount of 'Yes'/'No' responses allocated by the respondents to the question posed.

Table 6: Intentions of the departments to incorporate green-building or sustainability content in their education portfolio

<i>Responses</i>	Yes	No	<i>Total</i>
Number of respondents	4		4
Percentage of total	100		100

All four of the departments that indicated in questions 1 and 3 that they do not offer green-building or sustainability programmes or modules as part of their education portfolio, have indicated in question 5 that it is part of the department's plan to include green-building or sustainability programmes or modules in the future. This response may be interpreted as a positive indication that built-environment departments are starting to understand the importance and the potential of incorporating green building and sustainability modules into programme curricula.

4.7 Specialists in green building or sustainability at built-environment departments

The purpose of question 6 was to determine the level of expertise available at the built-environment departments for teaching and researching in green building and sustainability. Table 7 reflects whether the built environment departments have specialists in green building or sustainability as part of their staff portfolio. The data in Table 7 shows the amount of "Yes"/"No" responses allocated by the respondents to the question posed.

Table 7: Specialists in green building or sustainability as part of staff portfolio

<i>Responses</i>	Yes	No	<i>Total</i>
Number of respondents	6	2	8
Percentage of total	75	25	100

Table 7 shows that 75% of the departments represented do have a staff member/s who are specialists in the area of green building or sustainability. According to the literature reviewed, high-quality education depends on qualified teachers and the incorporation of training those teachers. It may be argued that the green-building

education in built-environment departments is on a positive track, considering the availability of lecturers with knowledge and skill in the area of green building and sustainability. Based on the response to this question, it could be postulated that built-environment departments at tertiary education institutions are taking positive steps toward progress and growth of green-building education in South Africa.

4.8 Green Star SA Accredited Professionals in built-environment departments

Question 7 relates to whether the departments represented have staff members who are Green Star SA Accredited Professionals. The purpose of this question was to determine the leadership role of the departments represented in the green-building industry. Table 8 reflects whether the built-environment departments represented have Green Star SA Accredited Professionals as part of their staff portfolio. The data in Table 8 shows the amount of 'Yes'/'No' responses allocated by the respondents to the question posed.

Table 8: Green Star SA Accredited Professionals as part of staff portfolio

<i>Responses</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Number of respondents	1	7	8
Percentage of total	12.50	87.50	100

Green Star SA Accredited Professionals are leaders in the area of green building. The inclusion of such highly qualified and knowledgeable individuals may reflect commitment, quality and leadership. Table 8 shows that 87.50% of the departments represented do not have Green Star SA Accredited Professionals as part of their staff portfolio. Based on the response to this question, it may be argued that built-environment departments at tertiary education institutions have not started to play leadership roles in terms of the development and growth of green building in South Africa.

4.9 Green-building or sustainability research at built-environment departments

The purpose of question 8 was to determine the level of research done by the departments represented in green building and sustainability. Table 9 reflects these departments' engagement in

green-building or sustainability research. The data in Table 9 shows the amount of 'Yes'/'No' responses allocated by the respondents to the question posed.

Table 9: Green-building or sustainability research at built-environment departments

Responses	Yes	No	Total
Number of respondents	8		8
Percentage of total	100		100

Table 9 shows that 100% of the departments represented indicated that they engage in research pertaining to green building and sustainability. According to the literature reviewed, one of the main roles of tertiary education institutions is to conduct research. Investigating the topic of green building and sustainability and thereby identifying ways of achieving sustainable production and consumption, including knowledge, skills and awareness is a responsibility of built-environment departments. Based on the response to this question, it could be postulated that built-environment departments at tertiary education institutions are fulfilling an important role in terms of the growth and progress of green building in South Africa. However, one could argue that this result does not support the actual current level of green-building research activity in the industry.

4.10 Green-building or sustainability research published in accredited journals

Question 9 relates to whether the research in the area of green building or sustainability, at the departments represented, is published in accredited journals. The purpose of this question is to determine the quality and validity of the research conducted by these departments in green building and sustainability. Table 10 reflects the publication of green-building or sustainability research in accredited journals. The data in Table 10 shows the amount of 'Yes'/'No' responses allocated by the respondents to the question posed.

Table 10: Green-building or sustainability research published in accredited journals

Responses	Yes	No	Total
Number of respondents	2	6	8

Responses	Yes	No	Total
Percentage of total	25	75	100

The quality and validity of research done could be tested against the publication thereof in accredited journals. Table 10 shows that 25% of the respondents indicated that the research completed by the departments represented has been published in accredited journals.⁶ Based on the response to this question, it could be argued that the quality and validity of the research done on the topic of green building and sustainability are not at a desired level and, therefore, not contributing to progress and growth in terms of new knowledge or data pertaining to the research topic.

5. Conclusion and recommendation

Appropriate literature gave rise to a range of structured questions, which were used to obtain qualitative data from the survey participants. Analysis of the literature and the results from the questionnaire survey reflected the *status quo* of green-building education in South Africa. The research results showed an urgent need for green-building and sustainability education to students studying towards built-environment professions such as architecture, quantity surveying, construction management, and urban planning.

There seems to be an increase in green-building modules being offered as part of programme curricula by built-environment departments; however, few complete programmes in green building or sustainability are offered as part of education portfolios at academic institutions. Programmes and modules also appear to be varied in terms of the degree levels; this limits students in terms of choices of different academic institutions, location and language. The analysis of the responses reflects an increased amount of staff specialising in green building or sustainability at built-environment departments; this is a positive step in terms of green-building education. However, few of the departments represented have Green Star SA Accredited Professionals as part of the personnel portfolio. This reflects a lower level of leadership and expertise available to support green-building progress and growth.

It was also determined that green-building and sustainability research is conducted at built-environment departments, but hardly

6 It could be assumed that the balance of the research, as reflected in Table 9, was presented at conferences.

any of the research produced reflects quality and validity in terms of accredited journal publications. Green-building education at built-environment departments at academic institutions is lagging behind and progress seems to be slow, but there are signs indicating that positive changes are being made to introduce and implement green-building and sustainability education.

This research does not consider the *status quo* as final, as sustainability is achievable, but not through experience alone; a strong educational component is necessary in the industry in order to increase industry's understanding and awareness of the contributors to, and the solutions for climate change. Further research on curricula revision and renewal is needed in order to develop an instrument to assist education institutions in revising curricula towards green building and sustainability in the South African context.

References list

Ahn, Y.H. & Kwon, H. 2008. The attitude of construction students toward sustainability in the built environment. *Journal of Engineering Education Research*, 11(3), pp. 70-77.

Ahn, Y.H., Kwon, H. & Pearce, A.R. 2009. Sustainable education for construction students. In: Sulbaran, T. & Sterling, C. (Eds). *Proceedings of the Associated Schools of Construction's (ASC) 45th Annual International Conference*, Gainesville, Florida, 1-4 April 2009, CD-ROM.

Ashworth, A. & Perera, S. 2013. *Cost studies of buildings*. 5th edition. [e-book]: Chapter 12.8 Research dissemination. New York: Routledge. Available from Google Books <books.google.com> [Accessed: 3 September 2015].

Ashworth, A. & Perera, S. 2015. *Cost studies of buildings*. 6th edition. New York: Routledge.

Blismas, N., McCoy, A. & Lingard, H. 2009. Academic arrogance or industry intransigence: Innovation inertia in the construction industry. In: McCarthy, J. (Ed.). *Proceedings of the Global Innovation in Construction Conference*, Loughborough, United Kingdom, 13-16 September 2009, pp. 481-491.

Bond, S. & Perrett, G. 2012. The key drivers and barriers to the sustainable development of commercial property in New Zealand. *JOSRE*, 4(1), pp. 48-77.

Carlisle, J.G., Brown, M., Foster, M., Bennett, A.K. & Sandler, K. 2004. Transforming the market for sustainable design: Effective public

policies and strategies. In: *Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings, 22-27 August, 2014*, Pacific Grove, California. Stockholm: ACEEE, pp. 24-35.

Cattano, C. 2010. Identifying barriers to address during the delivery of sustainable building renovation projects (Masters of Science in Civil Engineering), Clemson University.

Cortese, A.D. 2003. The critical role of higher education in creating a sustainable future. *Planning for Higher Education*, 31 (3), pp. 15-22, March-May.

Cotgrave, A. & Alkhaddar, R. 2006. Greening the curricula with construction programs. *Journal of Education in the Built Environment*, 1 (1), pp. 3-29.

Edwards, B.W. & Naboni, E. 2013. *Green buildings pay: Design, productivity and ecology*. New York: Routledge.

El-Deghaidy, H. 2012. Education for sustainable development: Experiences from action research with science teachers. *Discourse and Communication for Sustainable Education*, 3, pp. 23-40.

Elforqani, M.S. & Rahmat, I. 2010. An investigation of factors influencing design team attributes in green buildings. *American Journal of Applied Sciences*, 7(7), pp. 963-973.

Fien, J. & Tilbury, D. 2008. *Innovation of higher education for sustainable development*. [online]. Available from: <<http://www.bgci.org/worldwide/article/0294/>> [Accessed: 1 December 2013].

GBCSA (Green Building Council of South Africa). 2015. Courses and programmes. [online]. Available from: <<https://www.gbcsa.org.za/gbcsa-education/courses-and-programmes/>> [Accessed: 30 October 2015].

Gorgolewski, M. 2010. If I had a hammer. *Alternatives Journal*, 36(5), pp. 33-34.

Grimshaw, J.M., Eccles, M.C., Lavis, J.N., Hill, S.J. & Squires, J.E. 2012. Knowledge translation of research findings. *Science*, 7(50), pp. 1-14.

Hankinson, M. & Breytenbach, A. 2012. Barriers that impact on the implementation of sustainable design. In: Bragin, V. & Govoruhina, L. (Eds). *Proceedings of the Cumulus Conference Design, Business and Society: Dimensions of Interactions*, 4-6 October 2012, Ekaterinburg, Russia. Russia: Ural State Academy of Arts/ Russian Designers Association, pp.1-11.

Hogan, D. & Tormey, R. 2008. A perspective on the relationship between development education and education for sustainable development. *Education for Sustainable Development*, 6, pp. 5-15.

ILO (International Labour Organization). 2011. *Study of occupational and skill needs in renewable energy: Final report, ILO Skills and Employability Department (EMP/SKILLS)*. Geneva: International Labour Organization (ILO).

Jones, P., Trier, C.J. & Richards, J.P. 2008. Embedding education for sustainable development in higher education: A case study examining common challenges and opportunities for undergraduate programmes. *International Journal of Education Research*, 47(6), pp. 341-350.

Khan, S.H. 2013. Fostering sustainable development and environmental education programmes: Role of teacher training institutions and colleges of teacher education. *African Educational Research Journal*, 1(1), pp. 8-17, April.

Learn.org. 2003-2015. What is the definition of academic programs? [online]. Available from: <http://learn.org/articles/What_is_the_Definition_of_Academic_Programs.html> [Accessed: 1 November 2015].

Lee, S. 2007. Innovation in higher education for sustainable development. *The 11th UNESCO-APEID International Conference Reinventing Higher Education: Toward Participatory and Sustainable Development*, Bangkok, Thailand, 12-14 December 2007. [online]. Available from: <http://www.unescobkk.org/fileadmin/user_upload/apeid/Conference/11thConference/papers/P1__Samuel_Lee.pdf> [Accessed: 1 December 2014].

McGranaghan, R. & Kauper-Brown, J. [n.d.] Unit 6 Section 6.1: Disseminating results. In: *Developing and sustaining community-based participatory research partnerships: A skill building curriculum*. Seattle, Washington, University of Washington Community-Campus Partnerships for Health. [online]. Available from: https://depts.washington.edu/ccph/cbpr/documents/cpbr_curriculum.pdf.

Mead, S.P. 2001. Green building: Current status and implications for construction education. *ASC Proceedings of the 37th Annual Conference*, April 2001. Colorado, Denver: University of Denver, pp. 169-178.

Milne, N. 2012. *The rands and sense of green building: Building the business case for green commercial buildings in South Africa*. Cape Town: Green Building Council South Africa (GBCSA).

Nevin, E. 2008. Education and sustainable development. *Policy and Practice: Education for Sustainable Development*, 6, pp. 49-61.

Ryan, A., Tilbury, P., Corcoran, B., Abe, O. & Nomura, K. 2010. Sustainability in higher education in the Asia-Pacific: Developments, challenges, and prospects. *International Journal of Sustainability in Higher Education*, 11(2), pp. 106-119.

Shafii, F., Ali, Z.A. & Othman, M.Z. 2006. Achieving sustainable construction in the developing countries of Southeast Asia. In: *Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006)*, 5-6 September 2006, Kuala Lumpur, Malaysia. Skudai: Universiti Teknologi Malaysia, pp. C29-44.

Shari, Z. & Soebarto, V. 2012. Delivering sustainable building strategies in Malaysia: Stakeholders' barriers and aspirations, *Alam Cipta*, 5(2), pp. 3-12.

SACQSP (South African Council for the Quantity Surveying Profession). 2007. Continuing Professional Development Policy (policy wording was revised and adopted by Council on 20 November 2013). [online]. Available from: <[http://c.ymcdn.com/sites/www.sacqsp.org.za/resource/collection/DA46D206-7ECC-4B3E-841F-00B5E2FEFCC1/CPD_Policy_\(Revised_20_Nov_2013\).pdf](http://c.ymcdn.com/sites/www.sacqsp.org.za/resource/collection/DA46D206-7ECC-4B3E-841F-00B5E2FEFCC1/CPD_Policy_(Revised_20_Nov_2013).pdf)> [Accessed: 26 August 2015].

Tinker, A. & Burt, R. 2003. "Greening" the construction curriculum. In: Berryman, C.W. (Ed.). *ASC Proceedings of the 39th Annual Conference*, 10-12 April. Clemson, South Carolina: Clemson University, pp. 113-118.

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2006. United Nations decade of education for sustainable development: The DESD at a glance. Available from: <http://unesdoc.unesco.org/images/0014/001416/141629e.pdf> [Accessed: 1 September 2015].

UN (United Nations). 2011. United Nations Global Compact. *The University of South Africa communication on progress*. Pretoria: Unisa Press.

University of Arkansas. [n.d.]. Academic Policy 1621.10: Academic Program Terms and Definitions. [online]. Available from: <<http://provost.uark.edu/policies/162110.php>> [Accessed: 1 November 2015].

Witthaus, M., McCandless, K. & Lambert, R. 2010. *Tomorrow today*. A publication of the United Nations Educational, Scientific and Cultural Organization (UNESCO). London: Tudor Rose.

Wordreference.com. 2010-2015. The meaning of the word 'module' in the academic field? [online]. Available from: <<http://forum.wordreference.com/threads/the-meaning-of-the-word-module-in-the-academic-field.2812621/>> [Accessed: 1 November 2015].

Zhang, Q., Zimmerman, J., Mihelcic, J. & Vanasupa, L. 2008. Civil and environmental engineering education transformation change. *Proceedings of the American Society for Engineering Education (ASEE) Annual Conference, 22-25 June*. Pittsburgh, Pennsylvania, pp.1-14.