EDUCATING BUILT ENVIRONMENT PROFESSIONALS: PERSPECTIVES FROM UGANDA

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Abstract

In 2000, the Uganda Martyrs University introduced a new built environment program, a Bachelor of Science in Building Design and Technology (BSc BDT), marking the first time a private institution had entered the field of built environment education in Uganda. It was also the first new built environment program to be introduced in Uganda since the introduction - in 1989 - of the Bachelor of Architecture program at Makerere University.

The BSc BDT program is directed at graduating young men and women who can fill a gap that exists between Architects and Engineers on the one hand, and Construction Workers/Artisans on the other. In addition it is intended that, the BSc BDT fulfils the prerequisite requirements for entry into a two-year graduate entry Bachelor of Architecture (BArch) professional degree. This represents the first time a two-tier architecture program has been offered in the East and Central African region. A central objective of the BSc BDT and the BArch programs is to train budding professionals in contemporary methods and practices in order to solve problems in the built environment.

This paper outlines some of the issues that were faced during the development of the BSc BDT curricula, and in the implementation of a new integrated teaching and learning approach that emphasised Problem-Based-Learning (PBL). In addition, using examples derived from the experience of the authors, the paper will discuss some of the challenges and limitations faced by staff and students during the implementation of the initial program and during the change to PBL.

Keywords: architecture education, curriculum development, pedagogy, problem-based learning, Uganda.

1. Introduction

Formal architectural education is a relatively new undertaking in Uganda, having only been offered since 1989 when the Faculty of Technology at Makerere University, the oldest and largest universities in the country, began offering a five-year Bachelor of Architecture degree program. The inception of this program was an acknowledgement that there was a critical shortage of Architects in the country. Prior to this, prospective architects had to travel primarily to neighbouring Kenya or further away to study architecture.

In 2000, the Uganda Martyrs University opened a Faculty of Building Technology and Architecture, with the aim of strengthening the built environment professions in Uganda. This would be achieved by addressing practical aspects of architecture, project management and construction supervision, which were found to be lacking in the construction industry in Uganda. The programs were also intended to meet the educational goal of bringing about understanding, communication and collaboration between building professionals (Mees, 2000). This was to be achieved through an integrated architecture and engineering degree program at the undergraduate level, taking a multi-disciplinary approach to education of built environment professionals.

The faculty has faced a number of challenges in setting up and running its programs. These challenges include:

i. a lack of adequate teaching staff, both in terms of numbers and qualifications;
ii. students inadequately prepared for higher education (in regard to their motivation, comprehension and learning ability);
iii. the conceptualisation of the program, particularly in light of its stated objectives, and the educational system in Uganda.

This paper discusses these issues, focussing on shaping a way forward with the aim of achieving the key objectives of the faculty, including its aim of encouraging an understanding of the fundamental principles of architecture and building technology, and to become one of the best built environment programs in East and Central Africa.

2. Background

Prior to 1989, the lack of a local architecture program resulted in civil engineering, which had been introduced into the Faculty of Technology at Makerere University in 1970, becoming a highly sought after profession, as it was the only program that addressed building design issues. This effectively made Civil Engineers the 'Architects', and put Civil Engineering as a discipline, in a prominent position in the eyes of the public. Indeed to this day, Architects are often referred to as 'Engineers'; and for the most part the public does not know that there is a difference between the two professions. This situation is not unique to Uganda, as has been documented by Mennon (2000) in India, where Civil Engineers are seen as the 'master builders', with " … the input of the architect being decoration – rather than design – on the pragmatic contribution of engineers." This perception of architecture is evident in students, who equate architectural design to the beautification of a project – adding the final touches – as opposed to being the key consultant throughout the entire design and construction process itself.

One of the key objective for starting the Faculty was to alleviate the shortage of qualified personnel, as well as to improve the competency of middle level professionals in the building industry in the East African region in general, but in Uganda specifically. The enduring shortage of professionals was recently brought into the limelight by a series of spectacular building accidents that sadly claimed a number of lives, the most publicised being the collapse of a three-storey section of an hotel under construction for the Commonwealth Heads of Government Meeting (CHOGM) to be held in Uganda in November 2007. The collapse of this particular building on 1st September 2004, in which 11 people were killed and 27 injured, led to the formation of a Building Inspection Taskforce with a mandate to investigate the crisis in the building industry in Uganda. The Taskforce, which comprised of Architects and Engineers, had the task of inspecting buildings two-storeys and higher, recently completed or still under construction, in the three Districts of Kampala, Mpigi and Wakiso – the districts with the most construction activity in the country. During the two years the Taskforce undertook its investigations, further building failures occurred, not only in Uganda, but also in Kenya (Orlale and Kazungu, 2006), including a church building the day before the report was made public in March 2006 (Vision Reporter).

The findings of the Taskforce revealed among other things that:

i. The number and capacity of technical staff at the local government is not

adequate to match the overwhelming volume of construction;

ii. Approval of architectural plans at most of the local governments is carried out by urban planners since there are no architects in their establishment;

iii. Over 95% of projects do not have a maintenance plan and hardly any budget for maintenance. (Building Inspection Task Force for Kampala, Mpigi and Wakiso Districts, 2006)

Further, the Taskforce found that:

i. Only 33% of the developments inspected had a lead supervisor with a minimum of an ordinary technical diploma;

ii. Artisans play a big role in engineering projects in Uganda, [and] yet they are not organised so as to be guided by a code of conduct, and have no access to skills-upgrading and development programmes. (Building Inspection Task Force for Kampala, Mpigi and Wakiso Districts, 2006)

These findings corroborate the objective for the setting up of the Faculty of Building Technology and Architecture, with its aim of strengthening the building design and construction professions. The findings of the Taskforce however also raised pertinent questions about the training of built environment professionals: - Was the current approach to the education of built environment professionals appropriate? Could a new approach to the training of built environment professionals make headway towards resolving this shortfall?

3. The Built Environment Programs at Uganda Martyrs University

The Faculty of Building Technology and Architecture currently offers two programs of study:

i. a three-year undergraduate Bachelor of Science degree in Building Design and Technology (BSc BDT), open to high school graduates and;

ii. a two-year graduate entry Bachelor of Architecture (BArch) degree open to graduates of the BSc BDT program or equivalent.

Together these two programs make up the academic requirements for a professional qualification in Architecture. This two-tier program reflects the approach now being followed by an increasing number of built environment programs around the world. In Europe, this is the result of the Bologna Declaration (1999), which seeks to have a common degree nomenclature across all the European Union. In South Africa, a Ministry of Education objective seeks to homogenize degree qualifications, with students gaining an award at defined levels. As such, Bachelors degrees are awarded after three years of study, Honours degrees after a further year, and a Masters degree after an additional year after the Honours year.

A two-tier built environment program enables the implementation of a multi-disciplinary first-degree, with specialisations taken up at graduate level. A multi-disciplinary approach according to Doshi (1986), offers several advantages:

i. If for any reason a student is unable to continue through to the additional two year BArch course, he or she can opt out and still hope to continue in the future;
ii. Well organized research and feedback could be maintained in all allied fields, providing a good basis for the modification of teaching methods and the curriculum;
iii. The performance of the students will be improved due to the variety of choices. (Doshi, 1986)

The advantages of a multi-disciplinary approach can be seen in the decision by the University of Nairobi, to transform its architecture program - the oldest Architecture program in East Africa - into a two-tier structure in order to make their built environment programs more flexible for students, as well as to broaden the career options and opportunities of its graduates. (University of Nairobi, 2006) The choice of architecture and engineering as the basis for multi-disciplinary teaching at Uganda Martyrs University has been rather controversial, given that no such program existed in the region prior to this. The conviction of the prompters of the program was strengthened by the fact that the sponsoring university, Ghent University in Belgium had such a program in place. Given that most building design and construction projects in Uganda are undertaken by individuals in either profession, therefore demystifying the roles of each profession would be an advantage to the industry.

The BSc BDT program was thus envisaged as a hybrid program incorporating aspects of both architecture and engineering. This, it was hoped, would position the BSc BDT graduates to take advantage of the changing dynamics of the profession of Architecture and Engineering, but more specifically to enable an integrated approach to solving built environment problems as well as catering to the ever evolving diverse demands of the architectural and engineering professions.

The BSc BDT Course

The BSc BDT, the first stage of the faculty's two-tier built environment program, sought to define its graduates by taking the adept qualities of the Civil Engineering and Architecture professions as its core and is geared to fostering an appreciation of the complex realities of the building design and construction process. This three-year multi-disciplinary program

offers instruction in the fundamentals of architecture and engineering, and project management and construction technology, and is aimed at graduating mid level professionals who could take up positions as Construction Managers, Architectural Assistants and Engineering Technicians.

In effect, the program offers graduates flexibility in the choice of employment prospects not available in Uganda today. For the most part Built environment education, and education in general has focussed on training individuals to perform specific tasks and gain a qualification that could be easily identified. Consequently, in some cases the names of some programs are given more prominence - thus it is possible to find degrees with titles such as: Bachelor of Entrepreneurship and Small Business Management (Mak.) and Bachelor of Animal Production Technology and Management (Mak.).

The fact that very little research on labour markets has been undertaken in Uganda, has meant that the education system is generally out of step with reality. Uganda's education policy is for the most part reactionary, thus by the time the education sector is aware of a gap in sector, and attempts to respond, several years pass before qualified personnel can be provided. This has often resulted in severe shortages in different sectors, with little scope for crossover due to the existing narrow approach to education and academic enquiry. In which education is dominated by content rather than method, or according to Edwards, "Know-What" rather than "Know-How" (Edwards, 1996, p19)

3. The Early Years

Teaching

One of the biggest challenges in setting up and running a professional program in Uganda, and in any developing country for that matter, is the fact that there are relatively few qualified Instructors - this has been a significant problem for the built environment program at the Uganda Martyrs University. Initially the faculty relied on a number of expatriate instructors – as part of the European Union Assistance Project that set up the program – to carry out teaching in areas where expertise was lacking, whilst locally available instructors were sourced or trained. Unfortunately, locating local instructors has been more difficult than anticipated as:

i. the Uganda Martyrs University main campus is located over 80km from Kampala, and

the travel time of one and a half hours put off a number of prospective instructors;

ii. the proposed multi-disciplinary approach was unfamiliar to many and the effort required to carry out course design and teaching proved to be a big challenge. Not surprising as Problem-Based-Learning is a new pedagogy in Uganda;

iii. the teaching profession in Uganda is a relatively low paying profession, particularly in the professional fields where practice is more profitable.

iv. the shortage of practitioners makes it difficult to source qualified tutors.

Six years since the start of the program, a number of key positions are yet to be filled by fully qualified instructors. This has affected, teaching in areas such as Building Economics, Building Services, Landscape Architecture, and Interior Architecture. A recent publication by Kasozi (2005) highlights this, indicating that Uganda has one of the lowest Architect-Populations ratios in the world (See Table 1 and Table 2).

COUNTRY	POPULATION	ARCHITECTS	RATIO
Italy	57,500,000	99,300	579
United Kingdom	59,050,000	30,600	1,930
Australia	19,414,000	9,500	2,044
Malaysia	23,802,000	1,600	14,876
South Africa	44,812,000	2,700	16,597
India	1,032,473,000	25,000	41,299
Kenya	33,400,000	800	41,750
Uganda	25,000,000	130	192,308
Tanzania	37,100,000	120	309,167

Table 1: Number of Architects in Different Countries (Adapted from Tombesi, 2004 and Kasozi, 2005)

COUNTRY	ARCHITECTS	ENGINEERS	SURVEYORS
Kenya	800	600	1,250
Uganda	120	280	78
Tanzania	120	600	850

Table 2: Built environment Professionals in East African (Kasozi, 2005)

As a consequence of this shortage, a number of conditions described by Webster (2001) manifest themselves:

i. instructors with little or no experience are employed as teachers simply because there is no one else available;

ii. professionals are employed as teachers simply because they are in practice, but often lack the skills and training to carry out instruction effectively.

iii. instructors are not willing to dedicate the time required for academic work.

This lack of time, experience and/or training results in instructors falling back on the teaching methods and course content they had been exposed to as students, and in some instances went so far as recycling the notes from those classes.

Student Learning

In Uganda, as in numerous other countries, student perception of higher education is based on the didactic model, " … whereby a body of knowledge is transmitted from the teacher to the student" (Parnell, 2001) and forms the basis for teaching and learning. Students therefore come to university with the expectation that they will be 'spoon-fed' undisputable facts and rhetoric that would make them 'experts' in their chosen fields. The initial Faculty Handbook went so far as to boldly declare that the faculty was "established to respond to the needs of the well informed and capable design and building experts, …" (Uganda Martyrs University, 2000, p1).

It is impressed upon students in primary and secondary levels of education in Uganda that the teacher knows everything. This leads to a situation where students are not encouraged to explore ideas beyond what they are given in class. This has particular ramifications for built environment education where the diverse realities demand an appreciation not of facts, but concepts. According to Sotto, learning,

> … isn't what happens when we are fed information. Learning is what happens when we realize we don't know something, which we consider worth knowing, from a hunch about it, and test that hunch actively. In doing that, we may have to find some information first, but notice that finding that information is only part of that process. And notice that the process begins when we realize that we don't know something. (Sotto 1994, p50)

Regrettably such opportunities have been conspicuously absent in a number of courses, which were, for the most part, given in lecture mode. The 'Introduction to Computing' course is one example: at one stage it was found that students were passive participants taking in the information that was given to them, and not applied in practical sessions. This was a result of the instructor having gone through a similar system while at university. The result was that students did not fully grasp the power and capability of the computer.

4. Making the Transition

The Curriculum

In 2002, a review of the existing BSc BDT program was undertaken, with the aim of bringing the program in line with its intended aims and objectives. This was prompted among other things, by the fact that the curriculum was out of step with the intended outcomes, and was disproportionately biased towards engineering. It was found for instance that close to 30% of the total contact hours in first year were allocated to Mathematics (208 Hours), and over 70% of the first year dedicated to engineering subjects. With the course designated as a pre-architecture program, design courses were conspicuously absent.

	DESIGN AND COMMUNI.	TECHNICAL	CULTURAL	PROF.	GENERAL
BSc BDT (Old)	30.0%	34.0%	13.0%	16.0%	7.0%
BSc BDT (New)	38.0%	34.0%	12.0%	11.0%	5.0%
BArch.	73%	5.0%	13.5%	8.5%	0.0%

Table 3: Course Content Old and New Programs

The review panel sought to redress the situation through an assessment of the BSc BDT and in light of the intended start of the BArch program. This resulted in an almost complete overhaul of the BSc program, which included changes in the sequence of courses, inclusion of new programs, merging of others, and reduction in emphasis of non core courses. Mathematics for instance, was reduced from 208 hours to 78 hours; Fluid Mechanics was discontinued, while History of Architecture and Theory of Architecture were merged into a new course stream, Theory and History of Architecture. In addition, some important courses such as Urban Design and Sustainability, which had previously not been offered, were included in the new program. Design Studio courses were streamlined and given greater emphasis as integrated studios in which students had to demonstrate learning in their support courses. In addition, the issues tackled in the studios were reassessed, with projects gradually building up in size and complexity in each semester.

Pedagogy

As stated earlier, teaching for the most part was undertaken in lecture mode. However, as the program hoped to graduate men and women who could confidently approach and solve problems based on an understanding and analysis of the problem this teaching methodology was clearly inappropriate, and needed to be changed.

Introducing Problem-Based-Learning

Although problem-based-learning (PBL) has been at the heart of design teaching for a considerable period of time, particularly since the publication of Donald Schöns' "The Reflective Practitioner" (1989), it has struggled to find it's place in design teaching in Uganda. PBL has been of particular importance in the teaching of architecture and other professional programs such as Medicine and Business, as it encourages deep learning, and the development of the critical analysis and thinking skills vital in practice, what Schön (1991) describes as 'Reflective Practice'.

Using the example of the skills required to master the piano, Polanyi (1958) further illustrates this point. In the case of a pianist, he argues that it is possible to identify the keys on the keyboard through theory, but it is impossible to describe the notes that are produced. These vary with 'touch' and 'feeling', and are only achievable through practice. This cannot be taught or applied by using formulae or rules (Polanyi, 1958, p50). It was therefore expected that through the introduction of PBL, students would learn to solve problems systematically, and appreciate the value, through practice, of the principles and concepts they had been exposed to.

PBL was first implemented in the BArch Yr.I courses in 2004. In hindsight, this was probably not the most appropriate approach as the students entering the program BArch program at that stage, had been through the initial BSc BDT program in which instruction had followed the didactic educational model. The students therefore experienced difficulties adjusting to PBL as is evident in *Case I* below.

Case I – Architecture Studio V

In a recent studio project, students were required to design a mixed-use building that included a hotel as a major building use. In previous studio projects, design tutors were responsible for arranging visits to appropriate sites. The intension here was to give students an understanding of the steps necessary to resolving complex multi-dimensional problems. The studio is a bridge between the more controlled studio and the graduation project in which students are wholly responsible for their projects. The main field trips were organised by the tutors, however, for specific issues related to design issues, it was the students' responsibility to look up the information on their own. As it turns out, only one of the four students in this particular studio made any effort to visit a hotel and to find out more about its functioning and to critically analyse the performance of the spaces, etc. Two of the students who had not

visited a four or five star hotel, did not make an effort to do so.

The implementation of PBL was an awakening to students' in a way, as they were required to actively engage in their own learning by actively seeking out relevant information. The students also discovered that there was no single rationally correct answer or process, but rather numerous approaches, and therefore numerous answers. Undoubtedly, the emphasis on Rote learning in the primary and secondary education system, resulting in students encountering difficulties and displaying an inability to apply appropriate problem solving skills and procedures that they had been exposed to in previous courses. This tendency was not restricted to the design studio but extended to other courses such as Structural Engineering as shown in *Case II*, and Building Science.

Case II – Structural Engineering II - IV

In this series of courses, it was observed that students didn't learn a calculation method based upon the analysis of the problem; i.e., what data was available, what had to be calculated, what was most appropriate means to link both and how to proceed. Instead, students learn every specific application separately and try to solve other problems in exactly the same way as was given in the examples, following step by step the calculation process, seldom referring to explanatory notes where they had more fundamental information. Two examples to illustrate this point;

i. in a second year project in the BSc BDT program, in which students were required to undertake load calculations on a typical roof member using rules of thumb, not a single student made an attempt to provide a load path diagram or calculate the loads imposed on members. A number of students regarded this as not being part of the design task;
ii. while in the second year of the BArch program, in which students had to design a multi-storey multi-use building, students proposed structural solutions that were neither appropriate for the context, nor were they based on calculation or rules or thumb, but on speculation.

Such examples show a flawed approach to problem solving that seems to be quite common with students, whereby design tasks and support courses are compartmentalised and their interrelationship is not appreciated.

The difficulties students face with design tasks are clearly linked to the "learning process"

adopted in primary and secondary schools where students are told in no uncertain terms to do as they are told, and not to have an opinion – i.e. the teacher is always right. The initial curriculum had not considered this as a problem, and actually reinforced the problem by offering students little opportunity to express themselves, or even a chance to explore various possibilities or to reflect on what they were doing. This is exemplified by the students' reaction to the Computer Aided Design (CAD) course. The first intake of students had taken CAD in the first year of their program – as is often the case in Architecture schools the world over. It had been assumed – incorrectly - that this would aid the design process. Unfortunately, this had the opposite effect, restricting students' ability to conceptualise or visualise anything without the use of a computer.

5. Conclusion

According to Edwards, " … if they [architects] are to be effective catalysts for change, practitioners must develop wisdom, that combination of skills, abilities and attitudes which will enable them to operate successfully in a messy and unequal world." (Edwards, 1996, p18) This wisdom is gained through careful analysis and reflection as described by Schön (1991). Achieving this goal in the BSc BDT and BArch programs is a demanding task, but has to be achieved nevertheless if the Faculty is to graduate truly competent and reflective practitioners.

The first five years of the program have revealed that the training of built environment professionals in the context of Uganda is certainly not clear-cut. Not only do students learn in a fragmented way, with the sole purpose of passing exams, they fail to relate their learning to the global goal of becoming a professional. It is clear that much of this is linked to conditions outside the influence of the faculty, such as the **r**igid professional structure in Uganda, and a primary and secondary school system that has cemented rote learning as a key to success.

There is little doubt that these deficiencies in the primary and secondary school system need to be corrected in order to enable a more complete and in-depth exploration of pertinent issues, but also goes a long way to sparking 'Intellectual Passion' in students. Spiro Kostof points out that:

> The education of the architect is not exclusively, or even primarily, a function of schools of architecture … . The process of professional

> initiation starts its course long before its formal unveiling at schools of architecture. (Kostof, 1977)

However, a change in the education system is unlikely to occur in the near future, and even when the change occurs, it will take at least a decade for effects to be felt at university level.

Certainly it is not possible to expose students to all possible situations, which unfortunately is what they expect. The purpose of using PBL is to enable students to make judgements based on problems they can identify, rather than looking for specific patterns that they have been exposed to in the past. Introducing PBL into the built environment curriculum at the Uganda Martyrs University has been more difficult than anticipated and certainly requires further work before it is fully implemented. Nevertheless, PBL and the two-tier program have achieved some of its aims, with a number of students pursuing careers in different fields after the completion of the BSc BDT. Thus far, only a minority of students have continued into the BArch program, with the majority taking up positions in Construction, and some continuing their education in allied fields, such as Structural Engineering, and Urban Planning.

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