

# Technology and Architecture Education in Uganda

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**ABSTRACT:** Architecture education is a relatively new undertaking in Uganda. Despite this opportunity to develop an updated curriculum and pedagogy, an old paradigm continues to persist; isolating the teaching of architectural technology from 'main stream' design studios. The consequential inability by graduates to link architectural design and architectural technology in design is evident throughout Uganda, often with disastrous outcomes.

This paper discusses the implementation of integrated design studios in the architecture programme at the Uganda Martyrs University. Using a Project-Based Learning approach, these studios sought to introduce architecture technology as an integral part of the design studio, enabling students to build a holistic view of their designs. Two studios are the focus of this paper, Architecture Studio I, the first studio in the Bachelor of Architecture graduate programme which had a fully integrated studio, and Design Studio III, a second year studio in the undergraduate Bachelor of Science in Building Design and Technology.

The outcomes of the studios suggest students are better able to understand and apply technology in their projects and derive meaningful design outcomes if they are presented with the information as related to the design project, rather than as secondary information are given in support courses.

*Students will come to care about the constructed world only if academic staff can show them why this is worthwhile. Simply telling students to think about and experience the built realm differently (or to have them arrive at this through abstract design exercises) will have little long-term effect – as the contemporary constructed environment all too often confirms. (Coleman, 2003:353)*

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## INTRODUCTION

It is widely acknowledged that technology - in this context defined as subjects relating to Building Structures, Environmental Design (e.g. acoustic, lighting, thermal environment) and Building Services (Tiong, 1999) - is an essential component of architecture and should be taught as part of the architectural curriculum. Unfortunately, for many architecture schools, "... building technology has come to be viewed as scientific and quantifiable, ... Existing outside of the design studio in lecture course formats, building technology courses are considered, by students and design faculty alike, to be of secondary importance and are likened to chores." (Kratzer, 1997:34) Architecture technology is often regarded as not being fundamentally important to 'design', separated from architectural aesthetics and theory, entrenching in students - and eventually instilled in professionals - the idea that technology is not essential to architecture. (Allen 1997, Watson 1997, Tiong, 1999) This perceived irrelevance is reinforced by the 'division of labour' in the construction industry, where specialists handle different aspects of design and construction; a reality not lost on students, who take this separation as a reason not to take technology seriously.

Although technology forms a significant component of architecture programmes, it is often taught in separate support courses, unrelated to the design studio the main focus of architectural education. This paper contends that students will have a better understanding and appreciation of technology and its application in design if it is presented as being integral to the design studio, rather than as stand alone support courses. It presents the outcomes of two design studio in the Faculty of Building Technology and Architecture at the Uganda Martyrs University that were the basis for assessing the usefulness of integrative studios and Problem-Based Learning in the Ugandan context. This investigation was prompted in part by a continued lack of application of technology, not only in studio courses, but also more alarmingly in practice, often with disastrous effects. The paper also identifies a number of challenges faced in the development of an integrative approach to architecture education in Uganda, as part of the process of implementing the integrative studios.

## 1. BACKGROUND

### 1.1 Architecture education in Uganda

Prior to the 1990s, architects working in Uganda had been trained primarily at the University of Nairobi in Kenya. The architecture programme at the University of Nairobi was the first in East Africa and started in 1956, in what was then the Royal Technical College of Nairobi. The programme was originally geared towards educating members of the expatriate community offering instruction for the professional examinations of the Royal Institute of British Architects

(RIBA) set by the local allied society, the East African Institute of Architects (EAIA). (Marshall, 1963) It was not until 1989 with the establishment of the Bachelor of Architecture programme in the Faculty of Technology at Makerere University, that architecture education was established in Uganda. This had been promoted by a shortage of qualified architects, as well as a marked deterioration of the built environment in the country; a consequence of the lack of qualified professionals in the legislative and implementation process, among many issues. The development of the programme at Makerere University was however hampered by a lack of resources (accommodation, books, equipment, staff etc). The start of the programme itself had to be delayed by three years due to a lack of staff and adequate accommodation. (Mulumba, 1988)

### 1.2 Teaching and Learning

Lack of resources has greatly affected the delivery of education in Uganda. Lack of facilities and a shortage of staff often results in class sizes of 150 pupils at primary school level, while at university extremely large lecture classes are the norm, but these are not supported with tutorials or seminar sessions. As such, students have over the years come to rely almost exclusively on instructors for all information pertaining to their courses, with rote learning and regurgitation becoming an entrenched part of the educational experience. Increasingly students are coming to university expecting to be 'spoon fed' all the required information to make them experts in their fields. (Olweny and Nshemereirwe, 2006) For architecture in particular, this is worrying given students more often than not, come to architecture school with very little idea of what architecture is. Students therefore expect to be given a safe and reliable formulae for (re)producing architecture and therefore will take away whatever picture of architecture they are given – true or not. Any advice given in this context can potentially be viewed as a prescriptive solution, or answers perceived as the only correct answer. (Danby, 1969; Olweny and Nshemereirwe, 2006)

In general, architecture education in East Africa separates the teaching of 'design' from the teaching of 'technology'. Studio projects in this approach, invariably assume beautiful, full of character sites that are flat and have no constraints. (Morrow, 2000) Little if any attempt is made to relate design projects to specific issues of technology. This approach to architecture is ineffective, with the consequences evident throughout the country with sites being made to suite the building, rather than the other way round.

### 1.3 The Architecture Programme at the Uganda Martyrs University

The Architecture programme at the Uganda Martyrs University was set up in 2000 with financial assistance from the Belgium government and technical assistance from the Department of Architecture, Universiteit Gent in Belgium. Situated in a newly established Faculty of Building Technology and Architecture, the programme was conceived as a split 3+2 programme – the first in East Africa. It incorporates a three-year first degree, the Bachelor of Science in Building Design and Technology (BSc BDT), and a two-year graduate entry Bachelor of Architecture (BArch) degree. Unique to the BSc (BDT) programme is the fact that it combines architecture and engineering disciplines, an approach used in a number of European architecture schools including the Universiteit Gent and the University of Dortmund in Germany. This approach was viewed as appropriate for Uganda, given the poor state of the building industry in the country, particularly in relation to the understanding and application of technology.

It was envisioned that the new Faculty would be able to approach the design of the programme, curriculum and pedagogy, based on an understanding of global trends in relation to the local context. Initially, only the curriculum for the BSc BDT was developed, as the need for mid level technologists was regarded as a high priority. Billed as a programme to fill the gap between the Building Design professionals (Architects and Civil Engineers) and the Construction workers, the development of the BSc BDT curriculum was of crucial importance, particularly as this programme was also to serve as the background to the two-year Bachelor of Architecture programme.

The BSc (BDT) programme that was implemented, was more an amalgam of different components - from Engineering and Architecture - than a programme leading to a definite outcome. The programme was made up of a number of related components required for a built environment programme, but no real attempt had been made to make curriculum linkages across courses. This was despite two stated objectives of the programme being: i) to give students an understanding of the principles of architecture and building technology, and; ii) to design with respect for the human person and the environment. (Faculty of Building Technology and Architecture, 2000) Studio courses were separate almost secretive entities, and it was not clear how the support courses fed into them. The numerous courses in the BSc BDT also gave the impression that there was an effort to address the components of the programme through the names of courses, rather than through content.

**Table 1:** Number of Courses for each Year Level

	Uganda Martyrs Univ.	Makerere Univ.	Nairobi Univ.	Univ. of Adelaide
Year I	19	11	12	8
Year II	18	13	12	6
Year III	14	13	13	4
Year IV	6	12	6	4
Year V	5	5	8	3
Year VI			2	

A review of the initial BSc (BDT) programme was carried out in 2003, initiated partly in response to poor performances by students in the application of technology and aesthetic in design studios. It was found that although the programme was a prerequisite course for a two-year architecture programme, there was little evidence of any effort to deal with this aspect. One explanation for this was the fact that the Engineering profession had a strong presence on the curriculum committee. A key issue raised as part of the review was a lack of integration between key components of the programme – Aesthetics, Theory and Technology. Further, as all courses, apart from the studio itself, were taught largely as lecture based courses, with limited practical sessions. Students did not get the opportunity to make connections between courses, and in some cases – and rightly so – questioned the relevance of some courses, as it was not clear how they related to the overall aims of the programme. The review panel sought to assess the curriculum, course content and pedagogy in an attempt to improve student-learning outcomes. The review also aimed to develop a more 'integrative approach' to design with 'Problem-Based Learning' introduced as a means of encouraging students to *BEGIN* thinking of architectural design as being more than just the cosmetic applications of finishes, but as an integrated process of solving built environment problems.

It was determined that a revised approach was required to bridge the learning gaps evident in students. This was to be implemented first in the Bachelor of Architecture programme, as the curriculum was in the process of being formulated at the time. The Bachelor of Architecture programme would be based on Problem-Based Learning pedagogy. The aim, being to change the existing approach to architectural education in Uganda, in a bid to facilitate deep learning. The Bachelor of Science in Building Design and Technology on the other hand would have a major curriculum revision in 2006/2007, and as such it was determined that only minor changes would be made to the programme, but studio projects would be made more integrative to enable a smoother transition into the new structure. This is based on a view that the current architecture pedagogy is an impediment to the understanding of technology by students, and the continued separation of technology from the design studio results in an inability of students to solve real problems of the built environment.

## **2. STUDY METHOD**

The study was carried out primarily as an observational study during the 2005/2006 academic year. Two studio projects, ARC-401 Architecture Studio I, a studio course in the first year of the BArch programme, and BDT-201 Design Studio III, a studio course in the second year of the BSc BDT programme, were the subject of the study. Both studios set out to challenge students to be critical and creative in deriving solutions for real world problems. Feedback was sought from students approximately midway through the studio project, and then again at the end of the project as part of the Student Evaluation of Teaching and Learning questionnaires. In addition feed back from instructors – who had taught the associated subjects in the previous academic year - was sought.

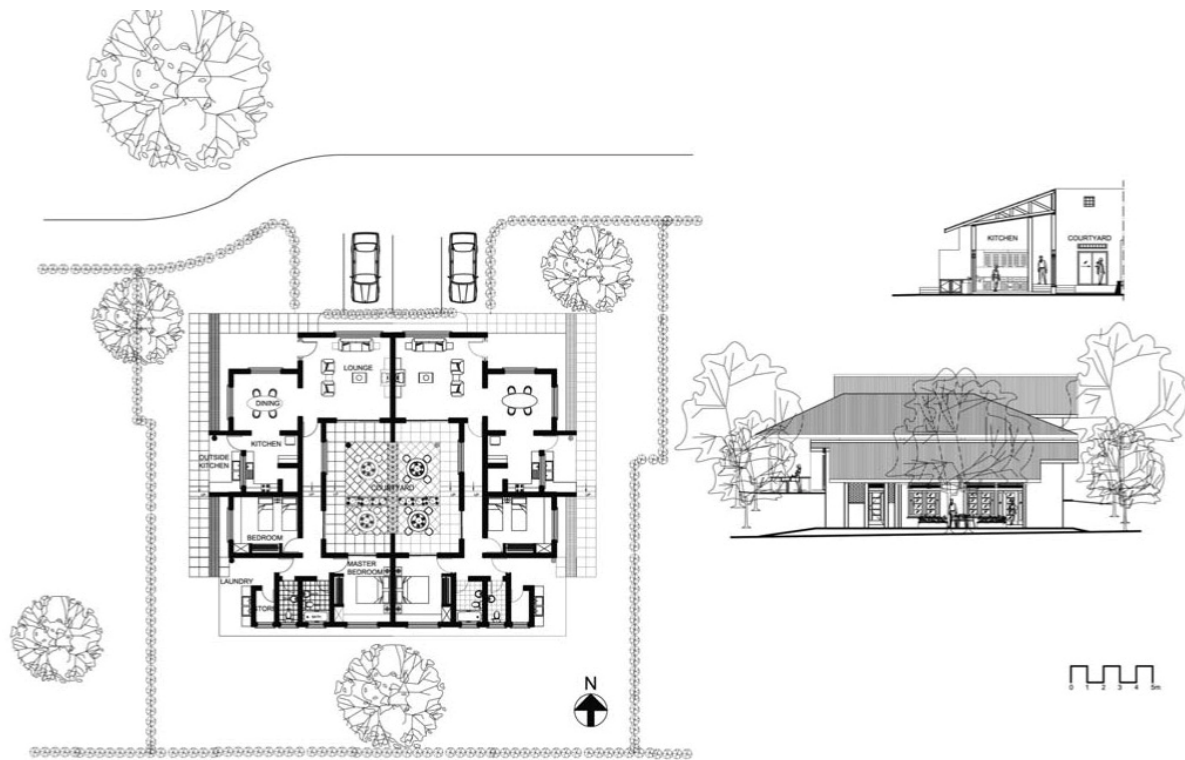
### **2.1 Case Study I: ARC-401 Architecture Studio I**

Undertaken over a seven-week period, Architecture Studio I is the first studio undertaken in the Bachelor of Architecture programme. In this intense studio, students explore domestic architecture in Uganda, using environmental design and cultural factors as a basis for the investigation. The design studio sought to get students to seek contemporary solutions to an apparently familiar condition, taking something familiar – a dwelling - and looking at it in a different light to understand how it is used (or not used) as well as how technology could be used to inform and in some cases inspire design.

The site selected for the project was located within the grounds of the Uganda Martyrs University, surrounded by existing residential buildings to the south and east, a student computer room to the west, and exposed to a recreation space to the north. The site had a slope of 1:10, and was protected from the prevailing winds (from the south-east) but this location did expose it to the evening sun, as well as noise from the recreation grounds mainly in the evenings, i.e. a real site, with real opportunities and constraints.

Four instructors were engaged in the studio (three architects with various expertise) and a Structural Engineer. Students were required to design a set of 2-3 bedroom-housing units to suite the family of a university lecturer. Instruction was given primarily through seminars and over the drawing board sessions, with the occasional lecture. A set procedure had been established early in the programme, with formal instruction at key points in the process. Formal sessions were however, modified and changed regularly based on student requirements and stages of progress. This format was selected to minimise the possibility of direct advice being given, and to get students to seek information through research and discussion, as well as through a critical assessment of their own work, and the work of their peers in an 'exploratory mode' as described by Watson (1997).

The outcomes of the studio revealed a significant increase in student understanding and application of technology in design over studios the same group of students had undertaken earlier, and indeed to a much greater depth than a studio undertaken in the 2005/2006 academic year by a different Course Co-ordinator. In one example, the proposal was built around a central private outdoor living space reminiscent of the central space of the traditional kraal the heart of the house – the gathering space. The outdoor space was a key component in the design strategy, and could be used as an extension of the living area, but more importantly could be accessed via a passageway that surrounded it like a cloister off of which the living spaces of the house were located. The space was protected from the hot evening sun, as well as the noise from the sports field. It also served as a key component of the natural ventilation strategy, the emphasis on single banked rooms, enabling easy cross ventilation through all spaces. The layout also allowed for a simple roof structure to be adopted a simple structure, creating attractive indoor spaces (Figure 1).



Source: (ARC-401 Architecture Studio I, 2005)

**Figure 1:** Student project exploring space.

In a second example, technology was again a key factor in the final design proposal. The student not only looked at the issue of heat gains from the outside, but also potential internal heat gains as well. Internal heat gains are a particular problem in housing in Uganda, due to the lifestyle of the occupants who often cook late into the night. While in traditional housing cooking was carried out in a separate building or outdoors, in modern dwellings the kitchen is part of the main house, making this an important issue. It was rationalised by the student that the kitchen was the heart of the home, and therefore family functions should radiate from there. A solution for the heat generated in the kitchen was to keep the heat above the heads of the occupants. This was achieved by the use of a double height space that could be vented at the higher level. Glazing to the south also aided in lighting of the space. Part of this double height space was used as a study area and incorporated a balcony to make use of the extra space created at that level (Figure 2).



Source: (ARC-401 Architecture Studio I, 2005)

**Figure 2:** Student project exploring materiality and thermal issues.

Certainly had the 'traditional' approach to the design studio been followed, in which students apply architecture science as an afterthought, such solutions would not have developed. Feedback gathered at the conclusion of the project indicates an overall satisfaction with the course. The course was described by one student as " ... Architecture in detail!" Students also commented that the process had enabled them to realise that " ... design[ing] is a continuous process in which one has to work referring to his previous concept developing sketches (work back and forth)," further, it was stated that " ... a good design is more than the house only. It's more of what the occupants feel

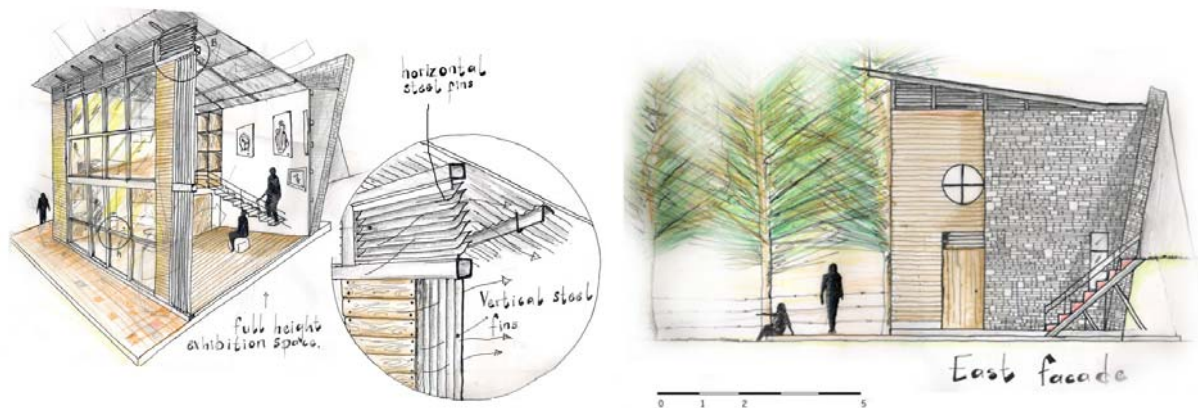
... that which surrounds the house ... it spreads as far as the type of environment around the house ... ." It is certainly evident in these statements that the integrative studio was a key factor in enabling a better understanding of the application of technology in architectural design.

## 2.2 Case Study II: BDT-201 Design Studio III

Unlike ARC-401 which was presented as a fully integrative studio, BDT-201 Design Studio III was presented as a separate course unit, with separate support courses. It was decided that the studio would be arranged such that students would have to demonstrate what they had learnt in the support courses as part of the studio project. This was indicated explicitly in the course handout, and mentioned at various stages by the Studio Instructors as well as the Instructors from the support courses who were engaged as roving tutors in the studio.

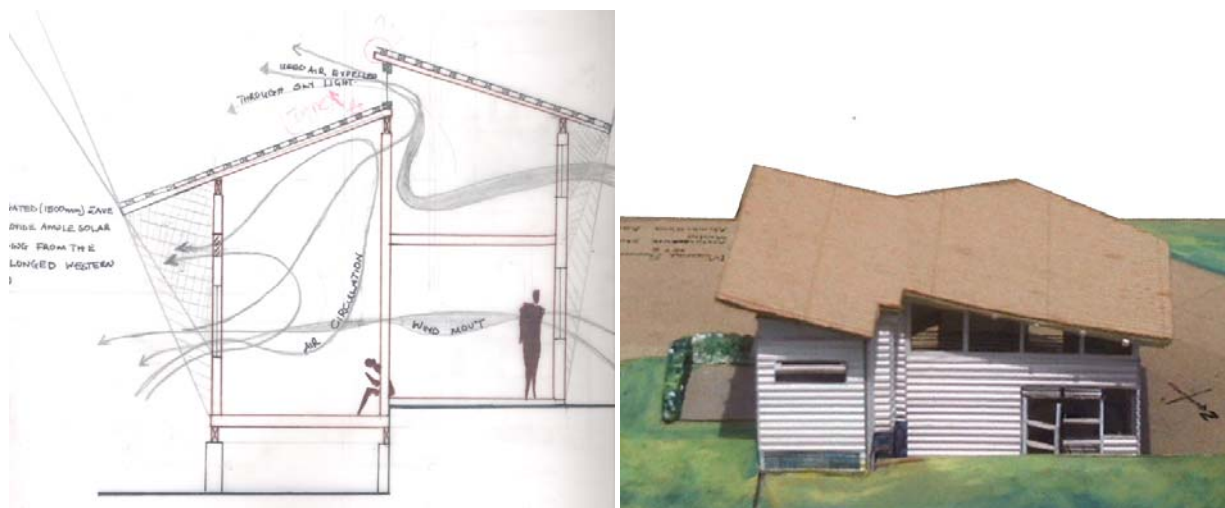
This particular studio, the first in which students in the BSc BDT programme to design a complete building. It was therefore thought appropriate to present the studio as a fun interactive studio in which the students themselves determined the outcome, rather than working towards predefined goals. In this scenario, the students were responsible for developing the design brief – having been given some basic guidelines. This was to try and initiate a key component of Problem-Based Learning – self responsible learning.

As with ARC-401, the site selected for this project would certainly not be regarded as 'ideal' for design in the tropics; however, this was deliberate to demonstrate to students that not all sites offered optimum conditions, and that the most has to be made of the conditions presented. Ideally the selected site should have been on a slope, but a relatively flat piece of land was selected given that this was the first building design project for these students.



Source: (BDT-201 Design Studio III, 2006)

Figure 3 and 4: Student projects exploring thermal issues and materiality.



Source: (BDT-201 Design Studio III, 2006)

Figure 5 and 6: Student projects exploring ventilation and shading.

The example projects indicated in Figures 3 – 6 explore various aspects of technology as required in the project. Although outcomes of this studio did indicate students did pay attention to the application of technology to their designs, more than was the case in previous studios at this level, there was still a general lack of connection between the 'design' and technology. Figure 3 for instance did not fully explore how the different materials are joined together, or whether the roof structure actually works - rafters and purlins are the same size, while in Figure 5, there is a lack of appreciation of the principles of wind movement. An exploration of materiality Figure 3 and 4 is not followed through to see how materials work together. Nevertheless, the fact that different materials are being explored is a big step as



it acknowledges that there is thought going into the way a building is finished, something that is not often done. The exploration of shading using models (Figure 6) proved to be an important step; however, this was not fully utilised by students, who see models more as a showcase of the final design, as opposed to a tool for exploring design issues.

The lack of detail in the exploration of technology was anticipated, given the set up of the studio programme as being separate from the support courses. Much of the background work they had undertaken in the support courses and as preliminary work for the studio including research on materiality, ergonomics and colour had been ignored. It became apparent that students perceived these as theoretical exercises, and as these components had been submitted, they were no longer relevant. Consequently, technical submissions were rather generic, and did not show an appreciation of the application of technology in design, an indication of the problems associated with the prevailing approach to architecture education in Uganda.

### **3. DISCUSSION**

An integrative approach to architecture education would appear to be an appropriate way of incorporating technology into architectural education, particularly in the context of Uganda. However, more has to be done in order to fully implement this teaching pedagogy into the architecture programme at the Uganda Martyrs University. Using an integrative approach, it is evident that student understanding and application of technology is better than it was when the technology was taught in stand-alone courses. Students were also better able to see the effect of decisions they made could have on various aspects of architecture. This was important in helping students become more reflective in their approaches to design, in that they were able to see and assess the consequences of their actions during the design process. It was also found that students were also more open to seek assistance from the instructors, and their peers rather than trying to complete tasks on their own. The fact that they were not all working on similar problems meant that there was no competition, and they could benefit from working to solve problems together. There were of course exceptions, with some students looking at the problem using the established approach, as a space planning exercise. In these cases, students produced a plan that on paper fulfilled all the space requirements, and then proceeded to apply the technological issues onto the plan, with less than satisfactory results.

#### **3.1 Challenges**

A number of key issues were revealed, shedding light on not only the learning of students, but also teaching methodology. Introducing PBL has proved more challenging than was first thought, largely a consequence of the fact that rote learning and regurgitation is deeply ingrained in the education system in Uganda. Students in general are not able to engage in courses at a deeper level, and are not encouraged to do so by instructors. This was seen with the students in the ARC-401 Studio, who found the lack of straight forward answers, and a strong emphasis on self directed learning in the Problem-Based Learning environment a challenge, markedly different from the lecture based system that they were used to.

The poor state of architecture in Uganda further adds to the problem. Ironically, work placement modules in the programme serve to perpetuate this problem. Students are required to undertake two of their placements on construction sites, and after the completion of the BSc. BDT with a registered architect. Students typically do not question what is being done, reinforced by cultural norms under which decisions by senior members of society are never questioned – thus the ‘teacher is always right’ phenomenon. Students therefore take what they see in offices and on site as correct, and do not try to question it to get clarification, even though in some cases it is contrary to what was given in the architecture programme.

The lack of staff is a major ongoing concern for the teaching of architecture generally, but architecture technology specifically and further hampered by what is described by Howieson (2002) as an ‘artificial schism’ between art and technology of architecture. In addition, not only is there a lack of qualified staff, available staff have a “laissez-faire” approach to education, with most educators coming to teach not for the career, but as a means of making extra money and as such are only part time! Further, it is evident that the philosophy of Problem-Based Learning is not understood by most of the faculty, exaggerated by the fact that many educators in architecture schools enter teaching without mentors, educational training or any clear direction of how to function as educators. Consequently it is the case that notions gleaned from own educational experiences without having evaluated their validity are passed along to students. (Glasser, 2000: Chhem, 2000) What is often brought to the classroom is information rehashed from old lecture notes, and delivered in a mode that does not encourage debate or application.

Changing the architecture programme at the Uganda Martyrs University, will indeed be a significant step towards addressing students’ learning deficiencies in architecture schools. However, the Uganda Martyrs University faces an uphill battle in this task, particularly from the Uganda Society of Architects (USA). A preliminary review of the programme revealed questions related not to the content, but to the names of courses – ‘Why is there no course called Sociology’, ‘Why is there no design Portfolio Class?’ The fact that the BSc BDT programme has more than 10 individual courses each semester is a consequence of this way of thinking.

The perception most students and indeed some instructors is that architecture education is ‘studying about’ rather than ‘participating in’ the profession. Architecture itself is viewed as the beautification of a building – the adding of colour and decoration! The traditional approach to university education in Uganda, with the lecture being the main mode of instruction, continues to reinforce this perception and does not encourage students to take responsibility for their actions. In this regard, the term ‘design’ itself has to be re-evaluated and taken in its broader context of being the process rather than only the aesthetic and theoretical dimension. (Boyer and Mitgang, 1997 in Watson, 1997)

## CONCLUSION

A principal objective of architectural education is to educate architects capable of creating meaningful environments. (Salama, 2002) An approach to architecture education in which there is a separation of the main components of design clearly is not a practical approach, particularly in the case of Uganda, where students take most things at face value. Students need to be shown how architecture technology is applicable in the real world, not using abstract examples. It is only, "... when the building of architecture is approached as an organization system that encompasses aesthetics, formal, and practical application, there is the possibility of transcending the common understanding of building technologies and materials acquired by rote mechanics of lecture and evaluated regurgitation." (Kucker, 1997:117) Through a revised approach to architecture education, the Faculty of Building Technology and Architecture at the Uganda Martyrs University, hopes to enable students to appreciate the importance of architecture technology as an integrated component of the design process. This aim will be further enhanced this academic year with a greater integration of courses and a more systematic approach to teaching. The teaching of technology is to be further enhanced, with the acquisition and use of new analysis tools and equipment that will give students a better understanding of the issues they are dealing with.

Through exposure to the multidimensional nature of architecture through Problem-Based Learning, it is expected that students will develop a more integrative approach to architecture. By showing that alternative scenarios can and do exist, and that the central concern should not be on repeating the rules verbatim, but solutions should be derived from identification of problems and opportunities, reflection and analysis, and application based on understanding of the situation. The continued separation of subjects in the teaching of built environment courses, reinforces not only the lack of relevance to design of these courses, but also does not give students the confidence to investigate the implications and consequences of different ideas that arise from multi-dimensional studios. It has to be acknowledged that architecture is a complex profession, and consequently demands an adoption of a new approach to the training of professionals. (Odeleye, 1988) The promotion of a Problem-Based approach ensures that architecture technology is regarded as being a part of the design process itself, and that this IS design itself.

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