Exposing architecture students to vernacular concepts

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ABSTRACT: The Department of Architecture at the University Free State offers students a curriculum that encourages the use of earth construction through both theoretical lectures and practical experience. Lecturers need a clearer picture of the way students learn from projects. This study focuses on curriculum development relating to equipping first-year students with the ability to produce contemporary buildings that reflect vernacular architecture in South Africa. The curriculum development at the Department of Architecture is analysed to show the outcomes of first-year students in preparation for future applications using earth-construction techniques. Case studies of an anthropomorphic hut-building project are discussed to illustrate experiential learning utilising limited natural materials in an exposed landscape. The findings provide valuable indicators for preparing architecture students for the application of vernacular architecture in future projects, and evaluate the significance of vernacular architecture in the 21st century.

1. INTRODUCTION

Formal architectural education has alienated the respective activities and responsibilities of the designer, builder and consumer of the built environment. Diverse objectives of the different professionals associated with the building process have lead to architectural responses that are frequently disconnected from place, culture and sustainability, often at the expense of the people who inhabit these spaces. This current situation directly opposes the definition of vernacular architecture as a community- or owner-built architecture (Oliver, 1997: xxii).

In the book, Vernacular Architecture in the Twenty-First Century: Theory, Education and Practice, edited by Asquith and Vellinga (2006), researchers comment on the extensive and complex relation that exist regarding the teaching, application and significance of the vernacular within a modern context, and give possible responses to the above-mentioned problem.

This study investigates how the process of designing and building full-scale anthropomorphic huts can explore the poetics of construction within a specific architectural curriculum. These huts are built by first-year students of the Department of Architecture at the University of the Free State (UFS).

Davis (2006: 231) points to the contradiction that exists between professional architectural education and vernacular architecture. He also mentions that formal education “has traditionally promoted an attitude toward professional expertise that seems opposed to the idea of shared embedded knowledge” (Davis, 2006: 231-233). This observation directed the authors to analyse the way formal education can be helpful to the production of vernacular architecture in the 21st century.

The relevance of the study of vernacular knowledge is emphasized by reference to current global concerns over sustainability and cultural identity that continue to question the processes of modernization and globalization (Asquith & Vellinga, 2006: 10). The architectural perspective that vernacular knowledge must be integrated with modern knowledge to allow the development of contextually, culturally and ecologically appropriate settlements coincides with the objective of the making of meaningful place, which constitutes the theoretical foundation of the Department of Architecture at the UFS. This theoretical premise is based on the phenomenological model of Norberg-Schultz, as postulated in Genius Loci: Towards a Phenomenology of Architecture (1980) and The Concept of Dwelling (1993). Norberg-Schultz values and finds relevance in any man-made shelter (Swart, 2009: 52). This premise, which investigates the topological, morphological and typological theoretical model in conjunction with the continual emphasis placed on context and site specifics, aims to equip students with the tools necessary for developing an architectural approach that is sensitive to the socio-economic and environmental particulars of “place” (Swart, 2009: 55).
2. THEORETICAL BACKGROUND

In 1995 the Department of Architecture established the Earth Unit with two aims: specializing in earth building material and techniques (Bosman, 2000: XV), and equipping students with knowledge contained in the EBS Programme that would allow them to incorporate earth construction in contemporary architecture as sustainable solutions in the light of global awareness of sustainability. The EBS Programme, as part of the curriculum of the B Arch Stud degree, incorporates the first year under a general theme of The individual in the natural landscape, which focuses on the development of an anthropomorphic shelter within the South African landscape of the Free State. This hands-on experiential project comprises designing and building full-scale anthropomorphic huts using natural materials at hand, with focus on the application of earth construction. This project explores the transition from shelter to dwelling with specific reference to the making of meaningful place as defined by Norberg-Schultz (1980). The design and construction of these huts is a process that explores the perennial qualities of architecture through its archetypes of floor/wall/roof and inside/outside. This will be discussed in terms of a theoretical foundation and teaching methodology with reference to the following works:


2.1 Genius Loci

Norberg-Schultz (1980) explains man’s ability to connect meaning to the environment through the creation of specific places. He recognizes that when man dwells, he is simultaneously located in space and exposed to a specific environmental character. Through identification with this spirit of a place, the genius loci, a meaningful man-place relationship develops and states man’s sense of belonging. This character of a place becomes evident in the way a boundary of enclosure (floor, wall, and ceiling) is articulated or constructed within space.

2.2 Tectonic Culture

Frampton (1996: 2) discusses the tectonic quality of the structural techniques of architecture, which amounts to the poetics of construction. He refers to the evolution of the original Greek term tekton, which initially signified carpenter or builder, then gained a poetic connotation when the tekton, the carpenter, assumed the role of the poet, and, later, transformed from something specific and physical, such as carpentry, to a more generic notion of making. Eventually the role of the tekton lead to the emergence of the master builder or architekton.

According to Frampton (1996: 4-5) Semper visited the Crystal Palace Exhibition in 1851. Upon viewing the Caribbean hut Semper proposed an anthropological counter-thesis to Laugier’s primitive hut of 1753.

Semper published Die Vier Elemente der Baukunst [the four elements of architecture] in 1851, in which he investigated the basic elements of the primordial dwelling, namely, (1) the earthwork, (2) the hearth, (3) the framework/roof, and (4) the lightweight enclosing membrane (Frampton, 1996: 3-4).

On the basis of this taxonomy, Semper classifies building according to two fundamental procedures:

1. The tectonic of the frame within which lightweight linear components are joined to form a spatial matrix, and
2. The stereotomic of the earthworks within which the mass and volume are jointly formed by the repetitive stacking of heavyweight elements. The latter is based on load-bearing brickwork, be it stones or mud bricks. The Greek etymology of stereotomic, from stereos (solid) and tomi (to cut), also suggest this.

The taxonomy that Semper uses to classify the building crafts into the lightweight tectonics of the frame and the heavyweight stereotomic elements of the earth work reflects the two construction methods in vernacular architecture (Frampton, 1996: 3-4).

3. METHODOLOGY

The concept of “being” and “dwelling” is made accessible to each student by starting with the intuitive sense for shelter and exploring it within the student’s own understanding or experience of the human ecological (man, environment, culture and time) landscape. The complexity of this investigation increases as the student progresses from year to year. In the first year the focus is on the individual in the natural landscape (“me”); it focuses on the development of an anthropomorphic hut as dwelling within the Free State landscape. In the second year a group (“we”) is in the man-made landscape, in the group and the community (“the others and us”). In the third year the focus is on the human ecological landscape, the community and the individual (“the others and I”). In the fourth year, the Honours year, the focus is on the urban landscape and the totality of dwelling and be-
ing, embracing the self, us, the collective and others. In the Master’s year the totality of society is invoked in the “making of place” (Olivier, 2012: 45).

With place-making themes running horizontally through each year of teaching, students are introduced gradually to abstract, universally constant design principles and the ensuing means and ends, which are researched progressively in ever-increasing depth. The same design principles are introduced repeatedly in all design years, but are exposed from different perspectives and with increasing levels of complexity and sophistication.

These abstract design principles and means and ends are seen as constants. They are explored in carefully selected projects/problems, which act as variables, using specific methods of investigation, which are, in their turn, also seen as variables.

The design methodology is made accessible to students with the aid of the educational psychologist Bloom’s taxonomy (according to Anderson, Krathwohl, & Airansion, 2001) and the experimental learning cycle introduced by the educational theorist Kolb (1984). Bloom’s taxonomy favours a process that relies on students’ initial intuitive reactions to a situation from their existing frames of reference. The lowest level of the cognition triangle (memory or existing knowledge) is built up systematically to the next levels: understanding, implementation, analysis, synthesis, and evaluation at the apex of the triangle. The abstract design principles of the architecture course of study are initially explored within the existing or intuitive knowledge of a student, and later the student is lead to switch to a conscious process of design. It is important to develop students’ abilities in the upper levels on this model: analysis, synthesis and evaluation. Learning is maximised when students learn from their own experience. The tutors structure the students’ environment to optimize experience. Each year extends the students’ experience of the preceding year, thereby creating a cycle that functions progressively from concrete experience (diverging: no new material and linking with existing knowledge and experience), reflective observation (assimilating: relying on other people’s experiences), and active experimentation that accommodates use of knowledge and evaluation in terms of objectives (Olivier, 2012: 47).

4. DISCUSSION

5.1 Introducing the concepts of meaning and identification

The theme, *The individual in the natural landscape*, that comprises the foundation of the first-year programme is introduced to students through a variety of integrated projects and assignments in different subjects throughout the year. The first design project separates the individual from the landscape. Students have to interpret personal qualities or stories of themselves and their lives and represent this by constructing a physical object—a head-and-shoulder piece. Meaning is thus conveyed through the articulation of different materials and the observer’s ability to identify with certain symbols.

5.2 Meaning, identification and genius loci

For the second project, students have to visit two contrasting sites and translate their personal experiences of these two sites into one physical object. This personification of place serves as a tool to investigate the “spirit” of the place through the identification that exists as a result of an established man-place relationship.

5.3 From shelter to dwelling

The students’ first encounter with the *boundaries of enclosure*, the floor, wall and ceiling as defined by Norberg-Schultz, involves the design of a temporary disaster shelter that must provide protection against the elements and be able to transform spatially to accommodate the basic functions of eating and sleeping. These temporary shelters are constructed from natural materials and plastic on a full scale, and are intentionally focused on the individual within a temporary landscape to emphasize the development from shelter to dwelling. At the end of the first academic quarter, students engage in a three-week project that involves the full scale investigation of the design and construction of anthropomorphic huts.

5.4 Development of the master plan

This process commences with an exercise that investigates how the arrangement of huts contributes to a variety of public communal spaces, private spaces and possible orientation according to climatic conditions. Upon the completion of the exercise, students have to present a possible master plan for the future settlement of their group designed huts. However, over successive years the authors noted that the proposed intimate community spaces did not develop as planned, with individual, isolated huts disengaged from each other. As a response to the disconnection between the spatial interpretations of a “paper design” done on a scale of 1:500, and the translation of this design to a life-size scale, a full-scale investiga-
tion on site was introduced as part of the above-mentioned exercise. All students had to visit the site as a group, identify their specific locations within the community and participate in the setting out of the master plan. This active engagement with both place and fellow “dwellers” resulted in site-specific responses to geographical and climatic features while simultaneously addressing appropriate spatial relations between adjacent huts in the community.

5.5 Conceptual development

After the exercise on site, students return to the studio for a week and, in groups of two, design huts that have to accommodate sleeping and living areas. During this time students participate in a variety of exercises that involve the development of conceptual models, investigations into the hierarchy of interior spaces of the hut and the regulation of these spaces through different applications of the boundaries of space—the floor, wall and ceiling. Students are constantly encouraged to consider the site specifics of their location within the community and to develop their design in relation to adjacent huts. In order to address the diversity of student learning and the various aspects that contribute to place-making themes the curriculum incorporates vertical integration between the different subjects. The practical process of the design development of the hut during studio periods occurs parallel with discussions regarding the historical development and cultural significance of the primordial dwelling during the History of the Environment subject.

The introduction of the basic different earth-construction techniques during the subject Building Science introduces students to the possibilities of the material and they are encouraged to learn through active engagement and experimentation with the soil available on the site. The design solution that follows from these studio exercises is not regarded as the final product but rather the first result of a process that will transform as students develop a more intimate understanding of the materials and technologies during the construction period.

5.6 Process of construction

The transition from paperwork to construction commences according to structural responses of stereotomic and tectonic solutions as proposed in preliminary designs. Initial processes on site vary from excavation; the construction of floor slabs; the production of adobe bricks; and the assembly of shuttering for rammed earth, to the construction of a light framework of reeds. As a consequence of these different processes of departure and the close proximity of adjacent huts, students quickly start relying on the experience of fellow students, gained through active engagement with different construction techniques. The absence of electrical power on site encourages a process of craft as opposed to possible mass production. The structural techniques and articulation of the different resources—reeds, grass, bamboo and earth—emphasize the poetics of the construction and structure as an integral component of the aesthetics of architecture.

6. FINDINGS

6.1 Case Study 1: 2011

6.1.1 Conceptual development

The two students developed a conceptual model as an expression of the inherent tensile quality of reeds. A vertical screen was absorbed into the floor and roof, and was utilized to define an extroverted space associated with the public living area and a more introverted space associated with the intimate spatial character of a bedroom. Earthworks were interpreted as detached vertical screen walls that would provide additional protection from western sun and provide privacy from the communal area.

6.1.2 Construction process

The construction process commenced with the clearing of the site and a general setting out of the public and private area. In contrast to the standard construction process that specifically follows a predetermined plan; the final plan was regarded as a result of space defined by the tensile and flexible quality of the reeds used for the framework. The public social area was defined by raising the floor level by 80 mm; this also served as seating around an excavation of 400 mm, which created a sunken area for feet.

Figure 1. Case Study 1: Final Product 2011. Credit: J.H. Nel
6.1.3 Influence of place
The location of the public living space to the north and the private sleeping space to the west was a specific reaction to local climatic conditions. A system of layered boundaries of space served as protection against the western sun. The densely thatched bedroom to the west protected the living space from the strong late-afternoon sun in the west while a free-standing tectonic screen provided protection for the bedroom. The threshold between inside and outside was addressed by extending the raised floor level to define a veranda area at the entrance of the hut. This in-between space was not only regarded as a response to favourable summer conditions of the local climate, but also acted as a reference to verandas, which are generally associated with the South African farmhouse. The decision to raise the sleeping area 200 mm from the level of the living space also reflected a double-storey residential layout in South Africa, with public spaces located on the ground floor and private spaces on the first floor.

6.1.4 Significance
This innovative craft of tectonics and serious investigation into the inherent tensile and flexible quality of reeds served as a pioneer project for the students of following years regarding the structural possibilities of this material.

6.2 Case Study 2: 2012
6.2.1 Conceptual development
The students developed a conceptual approach that was regarded as a comment on traditional cave-dwellings as discussed during the History of the Environment subject. It was proposed that the primitive technique of the excavation of an earth cave would be utilized to define the internal spaces of the hut.

6.2.2 Construction process
The first processes on site included clearing the site, setting out the floor plan as developed in the studio and excavation of this plan. Hard, dry ground conditions resulted in slow progression of the excavation and after two days this process was temporarily halted to reconsider the initial conceptual approach. The students decided to utilize the excavated ground and construct a bank that raised the ground level around the excavation. Instead of continuing the excavation process to reach the depth required for the internal height of the hut, the adjacent landscape was manipulated and extended to provide this additional height. A tectonic structure connected to the stereotomic mass of this artificial hill defined a wall and roof over the sunken spaces.

6.2.3 Influence of place
As a response to climatic conditions, the students utilized the insulating quality of the heavy mass of earth to provide protection against the western sun. The quality of light inside the hut was regulated through the framework of reeds that was not fixed in a static position, but could open to the north and east. Different methods of thatching allowed filtered light into the living area and provided complete protection from the elements to the private sleeping area.

6.2.4 Significance
This experience emphasizes the importance of an architectural process that can be adapted to accommodate the particulars of site as experienced by both the builder and architect to allow the development of site-specific architecture.

6.3 Case Study 3: 2013
6.3.1 Conceptual development
The conceptual development investigated the spatial and anthropomorphic relation between the semi-public living space and the private bedroom. The disconnected spaces of the first model were developed into interlocking spaces during the second model and the students immediately orientated the model to allow additional protection from the western sun through the incorporation of a free-standing screen to the west. Public seating on the outside extended to the communal area between adjacent huts.

6.3.2 Construction process
The construction process involved a thorough investigation into the detailing of different materials to accomplish the proposed design. The contrast between the public, social function of the living space and the private function of the bedroom was emphasized by juxtaposing a lightweight tectonic structure and a heavy stereotomic structure. The articulation of the tectonic structure from natural ground level was achieved by the development of joint detail between the floor and wall. A system of double reeds was incorporated into the raised floor level and extended beyond the slab to allow the connection of the vertical frame above the ground level. The private bedroom space was constructed utilizing rammed-earth-construction techniques. This aesthetic detail of the wall surface of bedroom is regarded as a product of construction and emphasizes the poetic quality of both construction and structure.
6.3.3 Influence of place
The orientation of the hut simultaneously addressed local climatic conditions and the relation to communal areas between adjacent huts. An investigation into the construction technique of flat earth roofs enabled the students to construct the bedroom as visualized during the conceptual development. However, this traditional construction method of the semi-arid Karoo is not an appropriate construction in the Free State, a region that experiences frequent rainstorms during the summer. The inappropriate application of this technique emphasizes the problem that exists when the personal objective of the designer or architect prevents a design process that does not consider local existing conditions of place.

6.3.4 Significance
The final design solution is regarded as a product of detailing, involving the active engagement by students with the process of construction and articulation of materials.

5. CONCLUSION
The first-year program presented by the Department of Architecture of the UPS incorporates a learning process that integrates the theory of the making of meaningful place as defined by Norberg-Schultz with the practical process of construction. Through active engagement with the geographic climatic features of the site; the available resources and the process of design and construction, students learn valuable lessons regarding an architecture that is responsive to the specifics. In addition; vernacular studies surpass investigations regarding the specifics of context and climate to also include cultural studies, anthropology, economics and sociology. As an isolated academic exercise the project does not suffice in developing a proper understanding of the significance of vernacular architecture in the 21st century. The significance of the lessons learned during the full-scale investigation of the hut-building process substantiates the incorporation of similar exercises throughout the curriculum of the B Arch Stud degree. The complexity of the investigations can increase as students progress from year to year, in the end properly addressing the various aspects of vernacular architecture. Such an educational system will emphasize the importance of learning by a process that engages with the physical and cultural context, as opposed to a system where learning occurs only on paper, separate from the construction process and local community.

6. REFERENCES