

The Construction of a Green School: an Interactional Multidisciplinary Perspective

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Abstract

It has been understood by several practitioners as well as academicians that sustainability has a position of its own within the realm of architecture, which conventional architectural core curriculum does not envelop.

This paper represents a broad synthesis of activities administered by the author in a school of architecture in Cochin, Kerala over the past two years, as part of a series of sustainable workshops and lectures included within the core curriculum to facilitate faculty, students and practitioners to be part of academic methodology that proposes a series of values and practices, knowledge outcomes, curriculum structure, methods for learning, and priorities for convey of the pedagogy – that aim to encourage the efficient execution of sustainable environmental design at diverse stages of architectural education, practice and research.

Keywords: Sustainability, architectural education, pedagogy, practice, research

INTRODUCTION

Sustainability and related fields has recently had a persistent influence and prevailing occurrence within higher education programmes. A variety of anthropogenic impacts on life systems on Earth, hastily altering climate and undeniable substantiation of the same, several international directives relating to the pursuit of sustainable development, rigid legislative requirements are all signs of the actuality that education must have a rather significant role to play in addressing these global challenges. The building industry and the various stakeholders concerned in it must act suitably and determinedly as they are key contributors to large-scale emissions and wider ecological issues.

Sustainability ought to develop into a schema as a response to the considerable accountability that educators, students and practitioners hold in architecture and allied fields. But it is

also to be stated that abundant instructive, authoritarian and professional barriers need to be overcome and redefined.

This paper chains the prerequisite, but not restricted to flexibility, self-sufficiency, cultural variety and novelty in architectural academic training and other allied disciplines.

It does not embrace advocating the standardisation of any academic methodology in programmes of advanced learning. Sustainability within education is an emerging theory that transcends disciplinary limitations, wielding a potentially reflective but also unclearly understood and requires an in depth manifestation on the way future generations of students and practitioners are educated in professional institutions.

In this paper we discuss an example on how the faculty along with the students facilitated and led to the expansion of an architectural school campus at the same time involved in inclusion of sustainability as a part of their curriculum and encouraged them to ask broader questions and approached sustainability in a non-prescriptive approach. The various stakeholders involved within a learning process of this nature included the management of the school, the heads of the institution, the students, local practitioners and academicians and an entire team of masons and labourers from the town of Auroville.

Programme Configuration and Methods of Learning:

It was predominantly imperative to understand the meaning and inclusion of ‘Sustainability’ and a theoretical clarity such that what emerges out of the various exercises does not emerge as essentially a superficial consensus. It was also understood that the exercises adopted was to answer the need for a fundamental revision of ethics, both at institutional as well as personal level and the values of all involved in the process.



Figure 1: Students collecting the required tools and resources. **Source:** *Author*

It started out as an exercise where the students were asked to design and present a collaborative effort directed towards the construction of a new block in the existing campus of the architectural institutional such that it would significantly influence the way of learning and thinking of the users.

Spaces that respond to the multi layered pedagogical challenges and were to incentivise on contextually sensitive conceptions of sustainability. Usually the curriculum involves a situation where theoretical knowledge is delivered and acquired independently from its practical application and creative design exploration much later in practice (Gelernter, 1988). But here the tutors learned that, Education for sustainability raises profound questions concerning how knowledge is acquired and applied, and the limits to discipline based pedagogies. Deep engagement with learning should be achieved by anchoring the acquisition of principles and values with experience, and establishing a unifying framework that permits effective dialogue across disciplinary domains (Warburton, 2003).

Investigational Pedagogical Experiments:

Thus the students, faculty and practitioners within the region were involved in enquiry and discussion on the development of the campus fostered by the pedagogy, and various connections between key concepts were made. The students were encouraged to engage in diagnostic and synthesis processes at diverse levels, emphasising indication and a critical understanding of the material palette to be chosen, local employment of labour, methods of construction, and use of low embodied energy methods. The students took active control over the cognitive processes of problem solving and adopted self evaluative process. So the design of an amphitheatre was adopted, where environmental design strategies and techniques were given utmost importance. The students were asked to try and deliver low(or zero) carbon emitting or low energy consuming materials while encompassing on the aesthetic, economic, ethical, social and

cultural values inherent in a responsible design process.

The students studied the surrounding areas of the site and chose earth construction as most apt based on the easy availability of good quality earth within the site itself. They were also asked to look into availability of labour, the estimates involved in the construction of this prototype of an amphitheatre, and various construction equipment needed.

All the students across the school were participatory along with the faculty; hence sustainable environmental design was seen as priority from the earliest stages of curricula and feeding forward into lifelong learning. This entire process of building the amphitheatre over several months played a fundamental role in raising awareness amongst students and professionals and in giving them the knowledge and commitment to put sustainable development into practice. The students had to take several important design decisions when the cost of the project was escalating the prescribed one, and where weather conditions such as sudden rainfall affected the ratio at which the materials were to be mixed at, and also the availability of construction equipment and labour. Along with the practical hands on knowledge, various experts and practitioners from the industry contributed to the theoretical framework that were required to enable the students to see the concepts that they were learning put into practice.



Figure 2: Production of CSEB blocks using the Auro 3000 from Auroville and the help of Architects in the region.

Source: *Author*



Figure 3: Using Rammed Earth Foundation for the Amphitheatre.

Source: *Author*

It was observed that the masons and labourers contributed immensely towards the knowledge base required building from paper to site. The amphitheatre consisted of two Nubian vaults that provided as shading structures, while the seating was made up of old electrical trenches that were sourced locally.



Figure 4: Construction of the Nubian Vault by the students as Shading structure in the design of the Amphitheatre

Source: Author

This process of working called for a collaboration and the pooling of skills and knowledge beyond disciplinary boundaries. ‘Sustainability’ was viewed as a core theme by all staff and students, demanding a reflection and review of the entire curriculum. The various faculty with their attitudes and beliefs, evolved beyond the role of a tutor delivering theoretical sermon to becoming credible and authoritative role models of integrity in a student’s life.



Figure 5: Laying of the CSEB Masonry as a ‘hands on’ built exercise

Source: Author

This ‘hands on’ built exercise was also open out to enthusiastic students and staff of nearby schools of

architecture who believed that they had a commitment of understanding and/or positive attitude towards sustainability. Before beginning the main building, it was important in promoting awareness and enthusiasm among the students and faculty and fostering inspiration and creativity based on exercises carried out earlier.



Figure 6: Use of discarded electrical trenches as seating

Source: Author



Figure 7: The making of Earth plaster for the structure

Source: Author

Motivation, either intrinsic or extrinsic is integral in such a process to foster rigorous and creative design thinking. It was learnt during the entire process that many students were motivated intrinsically as it originated from a challenge, interest, curiosity, and a desire for autonomy, a determination to achieve a task or a fear of failing it.

This kind of motivation was promoted on the basis of student centred learning, collaborative and process oriented methods. It was also observed that some extrinsically motivated students are moved by a need for recognition, praise or reward (eg grades). Such motivation can also be a powerful driver in today’s competitive academic and professional environments.

The faculty contributed with their constructive and well timed feedback that stirred debate and reinforced attitudes conducive to sustainable values. The faculty had to be flexible and critically reflective about their pedagogical approach, and were fully aware that what motivates some students could estrange others. This also led the students to devise and realize the landscape around the structure which required the theoretical knowledge of locally available species, their maintenance and formation of appealing spaces of interaction imperative in every campus.



Figure 8: The completed prototype of the amphitheatre

Source: Author

This led to the design of the main block where recycled steel sourced from the local Shipyard was used to build the structure of the edifice. The students upon research learnt that a concrete slab would be highly unsustainable and hence devised Ferro cement shells made using steel frame and jute bags.



Figure 9: Landscape designed around the amphitheatre, planted and maintained by the students themselves.

Source: Author

Numerous CSEB blocks made by the students themselves

were used to build the screen/jaali wall that not only kept the interiors thermally comfortable in the hot and humid tropical climate of Kerala but also gave rise to introvert studios, classrooms and spaces where the students could engage in design with least interruption. Students were well equipped by now to work in collaboration with the various masons and labourers, and also produced detailed drawings of the same.

The intense design studios and teaching methods provided theoretical principles, empirical applications and analytic capacities necessary to inform the creative exploration of design.



Figure 10: Structure built using steel sourced from the local shipyard

Source: Author



Figure 11: Use of light weight Ferro cement Shell placed between the steel members

Source: Author

The studio was supported by adequate minor projects undertaken in parallel by the students such as load testing of the materials, electrical and plumbing diagram, least use of carbon and energy intensive materials that promoted the

acquisition of cognitive notions and ethical values, with the development of analytical abilities from where design decisions can generate.



Figure 12: The campus as envisaged by the various stakeholders of the institution

Source: Author

1. Pedagogical Objectives and Learning Outcomes:

These exercises over the years, led to a whole new level of discussions and debates within the studio and a departure from an entirely 'left brained', chronological and objective, didactic process to one that embraced 'right brain' features, encompassing the skills of problem solving through creative and critical thinking, intuition and imagination. Because this was an ongoing process over a period of four years, with the addition of a batch every year, it stimulated the development of holistic insights and strived for coherence in the integration of disparate knowledge.



Figure 13: Use of locally available bamboo for construction of the canteen

Source: Author

Deep learning was achieved by anchoring ideas with experience and establishing a unifying framework that permitted meaningful dialogue and consideration of the interdependencies between curricular areas. Lectures, theory classes, minor projects, study tours, allied subject reading were pedagogically dependent of the studio.



Figure 14: The completed structure used as Canteen within the campus

Source: Author

Further enquiry, discussion and critical engagement with the interconnectedness of complex issues were fostered, with direct communication with the client of the project, the management, understanding time frame and economic framework allowing students to organise and structure disparate types of information into an articulate design. We saw students becoming active seekers of knowledge, emphasising reflection and taking full ownership of the challenges involved in balancing design creativity with environmental, social and economic responsibility.

Various experts such as landscape designers, masons, artists and material consultants were consulted with, with whom the students worked in parallel with, or sequentially from, disciplinary specific bases to engage with common problems.

So rather than a multidisciplinary method, where knowledge is generated by participants working together from a shared conceptual framework, a transdisciplinary method where ultimately their interactions hold out the possibilities of producing a new paradigm.

The learning outcomes of the exercises carried out could be divided into three subsequent stages:

- A. Sensitisation
- B. Validation
- C. Reflection

A. Sensitisation:

A methodology based on learning by doing with investigative “hands on” coursework given at the same time of delivery of knowledge, can engage students in their learning, instigate passion and enthusiasm for sustainability, and target the sensitisation of students towards the development of an architectural language informed by sustainable environmental design. In delivery and exploration of contents, working in a team can represent a productive methodology for the development of assignments, giving way for students to socialise, engage in discussion, creative thinking, problem solving and decision making. The learning environment should become one of cooperation and activity, fostering a dynamic interaction amongst students and faculty.

Learning outcomes at Sensitisation Stage:

Students should exhibit knowledge of:

- Key values and principles of sustainable environmental design.
- The potential offered by traditional and new materials and technologies to inform design.
- Benchmarks and environmental standards at national and international level.
- The relation with other disciplines concerned with the construction sector.

B. Validation:

Students should be provided with, and should contribute to produce, the knowledge necessary to validate the concepts explored at the first stage of education, together with the abilities necessary to propose innovative strategies for architectural design. To foster a positive attitude to the validation of principles and practices of sustainability, hence, tutors could play a key role and they often need to be supported by the institution in terms of training, multi/inter/trans disciplinary cooperation, and allocation of financial and human resources tailored to the needs of the students. Design, simulation and verification tools should be introduced to facilitate data analysis, assessment of performance and comparison of scenarios.

Learning outcomes at Validation stage:

Students should exhibit knowledge of:

- The framework and building practices that include awareness of costs and complexity of execution within creative architectural design.
- Identify, compare and assess environmental impacts and

performance of buildings.

- Make use of onsite observations and measurements, as well as interpretation of performance data and calculated results to inform design solutions.

C. Reflection

The range of abilities acquired at the first two stages of education should be reinforced and utilised to look comprehensively at the built environment and the overall architecture and construction process in a holistic way, also engaging with continuing professional development in research and design, and advocating lifelong learning. The role of research as a learning and design tool should be emphasised, as well as the analysis, verification and critical reflection on the outcomes achieved, thus promoting a pedagogical approach based on performance based learning and design research.

Learning outcomes of reflection stage:

Students should exhibit skills to:

- Take informed and holistic judgements and think critically about the nature of knowledge and how it is produced, validated and expanded.
- Relate the knowledge acquired to professional development at the various scale of architecture.
- Analyse and originally interpret performance targets so as to lead to innovative design and/or research solutions.

CONCLUSION

It has been argued in this paper that there is significance in exploring the advancement of curricula and academic responses in the attempt to question, infer, and assimilate the powerful concept of sustainability. It has also been recommended in this paper that there is significance in trying and distinguish the extent to which engagement is characterised by an ethically driven commitment towards sustainability.

It is to be noted that this paper does not just involve a change in the content of current educational frameworks and programmes, but rather requires asking deep questions about what, in the context of sustainability, the actual purpose of architectural education is. As a matter of fact, change requires more than mere content. We have to look beyond the knowledge delivered that successful education in sustainable design can be achieved.

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