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# From Zero to Sustainability: Developing an Academic Culture in Sustainable Architecture

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## ABSTRACT

The paper focuses on a five-year process of injecting issues of sustainability into an established academic curriculum at the University of Nicosia. The process engaged architecture students on platforms of both a social and an environmental sustainability and aimed at imparting technical skills, heightening ecological awareness and dissipating misconceptions regarding environmental sustainability as the sole factor impacting energy management and quality of life. The process was in constant flux, susceptible to local socio-economic conditions and as such, the paper traces the process' development of the initial placement and its subsequent adaptations and improvements. The paper examines and exhibits challenges, successes and lessons leant and will provide a guide and a roadmap to other, similar academic endeavours.

**KEYWORDS:** sustainability, community, environment, education

## 1 INTRODUCTION

### 1.1 Explanation of the Unit System

In the year 2009, the Department of Architecture of the University of Nicosia initiated a unique direction for its fourth-year students. Instead of a conventional fourth-year design studio followed by the fifth year where the thesis project is to be generated, the faculty proposed thematic Units from which the students entering their fourth year would choose from. Each Unit has a distinct area of concentration which is expressed within its prescribed framework.

The studio course, the *SDU Studio*, offered through the Sustainable Design Unit of the University of Nicosia's Department of Architecture, is the main focus of this essay. In 2013, it was decided by the faculty and administration that all Studio Units will run a course of three, consecutive years followed by a year of 'rest' when the studio course will not offered. Unit Studio would have to conclude and 'rest' for at least one year. Since the Sustainable Design Unit Studio will have completed a five-year lifespan by the end of the 2014 academic year, it follows that it will cease to be offered in the following year.

In addition to the studio studies, each Unit is comprised of supplementary courses, where the students are exposed to theoretical and technical issues associated with Unit. The faculty members undertaking responsibilities within each Unit are strictly selected for their expertise, knowledge and experience in the Unit's area of study. In cases where no faculty member in the particular area of expertise was available, adjunct faculty was hired in a concerted attempt to maintain the highest standard of education within the Units.

Regardless of which Unit Studio the students are registered to, they are expected to follow all supplementary courses offered by both Units. This achieves a much-needed balance and uniformity among fourth-year studies and it allows all students – including the ones who have chosen an alternative Unit Studio– to benefit from knowledge on the principles of sustainable design.

### 1.2 Sustainable Design Unit Studio and Supplementary Courses

In 2009 and 2010, the SDU Studio was titled *Exploring Dimensions of Slow Life Filtered through Sustainable Design* and its purposed was to investigate and juxtapose qualities associated with the Slow Life Movement and the principles of sustainable design and bioclimatic architecture. By 2011, it was deemed necessary to revisit the thematic parameters of the studio course and it was decided that the issue of quality of life was to replace Slow Life Movement. This change was mostly in response to students' interests, as those were observed by the instructing team. Thus the studio title became *Exploring Dimensions of Life of Quality of Life through Sustainable Design*. The same thematic was maintained in the following year. In 2013, however, as a direct response to the financial crisis that impacted Cyprus in March 2013, which led to an array of on-going socioeconomic concerns, the studio thematic veered towards addressing issues of environmental and social sustainability. Its title became *Exploring Dimensions of Environmental and Social Sustainability*.

As mentioned above, the Unit is comprised of the studio course and two associated supplementary courses. These courses are History and Theory of Sustainable Architecture and Sustainable Design Practices. The History and Theory course offers a comprehensive understanding of the principles of sustainable architecture within a historical and socio-political context, whereas the Sustainable Design Practices course provides the necessary technical background and mechanics to succeed in creating sustainable architecture. Both these courses have a stand-alone format and are offered independently from the studio course.

## 2 FROM ZERO TO SUSTAINABILITY

### 2.1 Philosophical Positioning

Twenty years ago, sustainable architecture, rarely included in conventional academic curricula, was considered by most non-academics as a fad. Academics themselves looked upon it partly as a novelty, although most certainly a worthy cause. Nowadays, where sustainability appears firmly in a large number of academic institutions, believers consider it a must and cynics consider it fashionable. The future generations, however, regardless of their philosophical persuasion, will most definitely consider it a necessity. Slowness, whether of living or of design, is an intriguing concept whose elusive nature encourages creative thought and sets numerous sceptical filters benefitting good design. Identifying, observing and evaluating slow life raises issues of perception on time and accountability to nature in ways that are intrinsic to sustainable design.

Let us try to playfully visualize all-things-architectural to be the product of a specific muscle group in the designer's subconscious. The muscle group is comprised of other smaller muscles which we can identify as "creativity," "practicality," "technical accuracy," etc. We can visualize the muscle at its earliest appearance in the subconscious mind, while it is still somewhat atrophied. Upon attending architecture school, the muscle is exercised and gradually starts functioning as a unit, all members flexing and contracting in unison producing a well-shaped, efficient muscle. Sustainable design and environmental responsibility should, in theory, appear in the designer's subconscious as members of this "architectural" muscle group and together they have the potential to make the muscle stronger, more efficient and more resilient.

Since in the case of the Department of Architecture of the University of Nicosia, studies focusing on sustainable design officially enter the curriculum for the first time in the fourth year, regarding the principles of sustainability as part of the muscle group mentioned above may not be a realistic vision. In the course of a five-year educational programme, it is probably safe to assume that the synergistic members of this muscle group have already been exercised into a shape by working together with method and system and any attempt for alterations may be met with resistance or with less than adequate results.

Consequently, the purpose of this studio and the philosophical quest supporting the Sustainable Design Unit as a whole, given the circumstances of the Unit's conception, is not to enforce sustainable design and environmental responsibility as surrogate members of the muscle group. The purpose here is for these two principles to be the primary forces that help shape the muscle to fitness. They are not to be regarded as muscles, part of a larger unit of body, but as the weights, the dumbbells if you will, the design muscle is trained with in order to become more capable and resourceful. A timelier introduction of sustainable issues into the department's curriculum may be a more beneficial investment in the future of environmental culture in architecture schools, but such adaptations take time, patience and perseverance on behalf of academics and administrators alike.

## 2.2 Practical Extensions

On a more tangible level, the mission of the SDU Studio is to elevate architecture and design to a coexistence of a harmonious and productive synergy of man, nature and the spirit of place. At the end of the studio journey, the students should be in a position to face their architectural identity in such a way where sustainable design will not represent an attachment or a supplement to their design principles, but both entities operate as an integrated process.

At the start of the studio journey, a foundation needs to be set where all attempts to define sustainability are put on the table and theories are taken into consideration. The global, multifaceted nature of sustainability is presented in such a way that students become aware of its ever-elusive definition and the range of disciplines it involves. This realization is inevitably faced by the students with some trepidation, so time is set aside for individual consultations helping students identify their own niche within the network of possibilities of sustainable design.

Sustainability is expressed not only as a sound building technique but as a deep socio-political issue that transcends generations, race and social class. The studio projects themselves, aim to explore the interdependency of issues of environmental, social and economic sustainability where students are prompted to develop individual, critical positions with regards to the broad concept of sustainability and to extend and explore those positions through their architectural design process.

## 2.3 Skills Attained

Graduating students from the Sustainable Architecture Unit will have attained the following skills:

- An ability to create architectural designs synergistic with nature that satisfy aesthetic and technical requirements
- A thorough knowledge of bioclimatic design, passive and active solar principles
- A basic knowledge of ecosystems and an ability to detect and evaluate them
- The knowledge that sustainability is not only an environmental parameter and the ability to translate sustainability in terms of social processes
- The ability to analyse a site in a social, structural, ecological and architectural context
- An adequate knowledge of the history and theories of architecture and the related arts, sustainable design, technologies and human sciences
- An adequate knowledge of urban design, planning and the skills involved in the process of environmental planning

- An understanding of the relationship between people, structures and ecology and an understanding of the need to relate buildings and spaces between them to human needs, scale and environmental sanctity
- An understanding of the profession of architecture and the role of the architect in society, his or her responsibility to nature and in particular, preparing briefs that take account of social and environmental factors
- An understanding of the methods of investigation and preparation of the brief for a design project
- An understanding of the structural design, constructional and engineering problems associated with building design
- The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations
- An adequate knowledge of the industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning

## 2.4 Assessment Criteria

Problem analysis

Initially, the students are expected to develop a range of ideas, rather than a single concept, that demonstrate a creative response to the brief of the SDU Studio. Within the framework of the assigned brief, the students are to identify the nature and the requirements of the task at hand, irrespective of whether the tasks are determined by the brief or whether they are self-generated. Tasks must be prioritized and any limitations imposed by the assignment must be taken into account.

The students are expected to provide full consideration of any intended audience of their work. In extension, they are expected to be in a position to identify and communicate problems and solutions in an appropriate matter. The proposed solutions must demonstrate a clear and purposeful initiative to the identified problems.

Research

Students are expected to apply an enquiring approach to identify a range of visual and textual sources, evaluate the information gathered and proceed with appropriate selection. Within this process, students must demonstrate the ability to synthesize different types of visual and contextual information and to reveal how research has informed the project's progress.

Conceptual development (generation of ideas)

Research will initiate and explore creative proposals as well as act as a vehicle to explore and develop a range of ideas that demonstrate a creative response to the research question as it is derived from the brief. The students are expected to foster links between their research, ideas and the intended audience.

Working methods (methodology)

As with every academic assignment, students are advised to plan their time efficiently and to complete tasks with time to spare for review by fellow students and members of the faculty. The SDU Studio also encourages working in groups thus promoting skills in leadership and cooperation. Working in groups also helps students identify their personal strengths and weaknesses.

Application of media skills

Students, who deal with their academic work maturely, will be able to develop the appropriate technical and manipulative skills to support the production of their project. They should also be able to demonstrate creativity in use of materials and methods as well as recognize and build on their individual strengths.

Quality of final product (visual, written and oral presentation)

The quality of the presentations is important and it should aspire to be as high of standard as possible. The visual and aesthetic impact must demonstrate the connection between the finished work, the original idea and the intended audience.

Any written work to be submitted during the two-year course of the SDU Studio must be presented as articulately as possible, with coherent arguments and it must speak of the views and values earned during the research. Students are encouraged to constantly review their written work, as this is the only way to strive towards improvement.

Although oral presentations can be a nerve-wrecking experience, clarity and succinctness are of the essence. The students are encouraged during studio time to constantly practice their oral argument so as to achieve the best possible result.

### 2.5 Studio Description and Pedagogical Methods

The composition of the instructing team has been a crucial element in the success of the SDU Studio. The aim has been to offer a diversity of expertise while maintaining constant the focus on sustainable design. The instructing team of the first year was comprised of two academics, the first being an architect who is an expert practitioner and academic in solar architecture and bioclimatics. He also served as the Unit's coordinator for its duration. The second team member is an urbanist and landscape architecture with an interest in sustainable urbanism and gendered space. In the years that followed, as the student number increased considerably, it proved necessary for the instructing team to be comprised of three members. Thus other faculty members included architects with an interest in restoration and experimental composition.

By year 2011, it became apparent that students showed particular interest in computer-aided design and fabrication and its potentials and applications to sustainability. As such, the instructing team final composition included, apart from the Unit coordinator, an urbanist/landscape architect and a member of staff with an expertise in parametric design and fabrication.

#### 2.5.1 Research Question and Theoretical Premise

Each student began his or her academic year with a particular research question that related their personal interests with the parameters of the studio thematic. Social and environmental sustainability were sometimes considered as tools to create good design and at times, they served as a pretext to improve existing conditions.

The research question can also be presented in the form of a thesis statement, or statement of intent. Previews research questions included: 'The Architecture of Reunification: the Case of Nicosia,' 'Traditional Cypriot Life: Slow or Fast?' 'Interrelation of Slow Life through Renovation,' 'Bringing Nations Together Through Sustainability,' 'Slum Dwellings in Istanbul: Urban Retrofitting,' 'Negotiating Consumerism Ideology through Natural Environments in Urban Settings,' Incremental Revitalization of Abandoned Industrial Buildings.'

A constant requisite of students from both the fourth- and the fifth-year studies throughout the five years of the studio's existence was the compilation of a thorough research of the theoretical premise behind their individually chosen research question. First order of business was to establish the research question (or thesis statement). Often students were comfortable in identifying their particular area of interest but had difficulties in drawing a succinct thesis statement that expressed their interest accurately and could clearly describe their investigative intensions. To mitigate these difficulties, students followed a targeted lecture on how to hone in on a thesis topic and were encouraged to complete various relevant assignments in order to help determine their research question.

Once the research question was established, each student conducted his or her supporting research on relevant design principles, architectural theory and discourse, construction techniques, sociological

and cultural processes, case studies etc. Students were encouraged to compose their research findings in the form of an academic research paper, including abstract, citations, bibliography etc. The students were expected to interpret and present their research in visual terms, in the form of diagrams, graphics, composite drawings, models and any other means that will enable the student to take the research finding and begin to understand it as a design tool. This proved to be a particularly challenging task, as students often found it easier to convey their research in words rather than images.

### 2.5.2 Site Analysis and Master-planning

After the initial influx of new information regarding the philosophy, mechanics and application of sustainable architecture, the students need a means to feel grounded. For this reason, establishing familiarity with the proposed site and with the climatic and geographical circumstances that are specific to it was regarded as top priority. The emphasis on site analysis is one of the elements that set this Unit Studio from other Unit Studios offered for fourth- and fifth-year students.

The first year the SDU Studio was offered, a specific site had been chosen by the faculty for all projects to be associated with. The site chosen is a multifaceted one since it is a National Park located in a suburb of Nicosia, flanked by a university campus, the Nicosia General Hospital, a commercial complex and some scattered residential districts. The paradoxical boundaries of this park make it a fascinating area of study with numerous possibilities and challenges whether the architectural intervention is a single building or a series of smaller, interrelated ones. Students, in groups and individually, were called to examine the park in its entirety and to uncover its layers of complexity and potential. Shortcomings of the park were scrutinized and discussed in a productive and educational environment, while case studies are used to offer depth and perspective. During several guided class visits to the park, students were called to investigate the site's literal characteristics but also to observe and document their own emotional responses.

Site analysis of the park and its surroundings was conducted in groups which later produced a series of overlays pertaining to basic analytical issues such as land use, fauna and flora, circulation, geology and topography. Some groups chose to examine issues of particular interest to them and produce relevant overlay maps. The finished product of base map and overlays was then scanned and made available to all students. Since this is the first contact some students experience with site analysis of this scale, they were encouraged to review the work of Ian McHarg and James LaGro. Once students were comfortable with the park's particulars, they were called to develop a master-plan for a theme park of their choice. This master-plan would serve them for the entirety of the year, since all their subsequent building interventions will be based on it.

The choice of that particular site shared by all students proved valuable on two levels: firstly, time was saved in site analysis and secondly, students were compelled to examine the principles of a unique urban ecology and provide design solutions that were challenging on the level of environmental, aesthetic and cultural preservation. Nevertheless, by the end of the first academic year, it was established that it would be more fruitful and constructive for the students if they were allowed to make their own selections on which site to locate their projects. This new direction led to the following two conditions: upon choosing a research question, some students first chose their academic area of interest and then chose a site as a testing ground for their hypothesis, while other students first chose a site they found dysfunctional and then invented a methodology for its remediation.

A favourite site analysis exercise affectionately known as "site reconnaissance." This exercise is intended to bring students physically and intellectually close to the site of their proposed intervention. They are required to section their proposed site to a grid where each square has the approximate dimensions of 2mX2m. Then the students are called to investigate and document each grid as a microcosm, isolating particular characteristics present in most of the grids and proposing a possible hierarchy. Through this exercise the students are encouraged to develop their own language of reading the landscape of their site. Their findings are then presented in class in the form of a conceptual model, stationary or interactive, or in two-dimensional images.

Skills in developing legible and purposeful master-plans were paramount in the Studio's pedagogical aims. In the first three years of their academic tenure, architecture students of the University of Nicosia had limited exposure to master-plans and regional design. Thus, special attention was given to familiarizing students with principles and techniques of master-planning, aided by the expertise of the landscape architect and through targeted lectures. Paradoxically, a majority of students have been selecting projects that span on a regional scale, although they are not confident in tackling matters of that scale.

### 2.5.3 Assignments

The first academic year of the SDU Studio was distinguished by a distinct assignment format. Projects are individual to each student. The fist assignment is the production of a master-plan of strategies and intensions. The next assignment was the design of a resting point (a small habitable space that is site-specific and exhibits the principles of bioclimatic design).

The following assignment was to produce a small structure of 50-100m2 based on the same principles developed by the previous exercise. This assignment presents the challenge of maintaining all bioclimatic lessons learnt in the previous exercise and applying them to a larger habitable area. The use of this structure, intended to be unique within the master-plan, promoted a use relevant to the park's chosen theme. Choice of materials must be dealt with more perseverance, bringing forth topics such as material longevity, potential toxicity, recycling and reusing. Energy-saving technology was investigated as well as other established technologies demonstrating the principles of sustainable architecture and construction.

The next assignment was to generate a 500m2 structure. The challenge of designing sustainably is now elevated to include architectural concerns such as access, entrance, space-use hierarchy, accommodation of auxiliary spaces, circulation and aesthetic acceptance within the natural landscape. Issues of cross-ventilation, orientation and exposure to natural sunlight were now examined more rigorously. These assignments spanned through the first academic semester (13 weeks).

The second semester (another 13 weeks) was dedicate to the final studio assignment and was a semester-long project intended to exhibit all skills acquired and practiced in the three projects of the first semester. A more complex building structure was expected to be generated responding to issues of site specify and sustainable design. Since energy performance was conventionally less efficient for larger-scale buildings, students also have the option to produce a complex of smaller buildings and to tackle the challenge of a mini urban environment surrounded by protected nature.

Since the following four academic years, site selection became personalized, the notion of structured assignments was not easy to maintain. Nevertheless, throughout the five years of its existence, the students of the studio were expected to develop their own brief, which for fourth-year students served as a good preparation for their self-directed thesis investigation that would follow in their fifth year of studies.

The following four years were structured as follows: the first six weeks of the year were dedicated to researching the chosen area of investigation and compiling it in a graphical format. From then on students were required to develop their strategies, architectural proposals and master-plan (if relevant.) The second semester is then dedicated to developing a significant part of the architectural proposal to an appropriate level of detail, including plans, section, elevations, construction sketches and photo-realistic renders.

Key elements in producing a successful project were:

- Dealing with complex environmental problems emphasizing the planning of large-scale buildings.
- Students are compelled to use their knowledge and experience of different constructional and structural models, evaluate their aesthetic properties and choose aptly and with sensibility from a range of possible outcomes.

- Students are encouraged to consider how the luminous and acoustic aspects of design can be manipulated to facilitate the activities to be sheltered and explores how they can control objective mood and convey symbolic values.
- Human and social impact of the built environment of the inhabitants of the project's particular environment.
- Contemporary perspectives on the relationship between human behaviour, designed environments and energy efficiency. In effect, the final project explores the implications of those relationships for the purpose and future direction of design education, design research and design practice.
- Students become aware of design factors affecting indoor comfort and explore concepts, structures and techniques that lie behind the realization of energy conscious design.
- The link between quality of life and energy consumption, the variation in fossil fuel resources and end-use energy in Cyprus.
- The role of renewable energies in reducing environmental impact.

### 2.5.4 Lectures, Guests and Reviews

Developing an understanding of design, maintenance and operation of the built environment while minimizing energy needs was a strong component of the studio's objectives. These issues were presented to students through a series of in-studio lectures by faculty members, expert guests and fellow students. Presentations were based on theory, case studies, technological advances and social issues. The basic framework of sustainable architecture, such as theory, ecology and technology was also offered to the students through the two supplementary courses they take as part of their fourth-year curriculum.

The SDU Studio fosters a culture of diversity of opinion and constructive criticism. Throughout the duration of the studio year, a series of guest lecturers and critics offered their time and advice to individual students, evaluating each project's merits, providing intriguing stimuli, feedback and helping each student elevate his or her work to the next level. All desk reviews with guest lecturers were conducted in the presence of at least one of the regular studio instructors to better communicating class objectives and to facilitate communication.

Guest critics have included practicing architects with a wide range of expertise, such as bioclimatics, urbanism and digital design, professors and instructors from local and international universities and artists specializing on ecosystems. Through their diverse educational background, the guest critics, having studied and worked in countries such as Germany, Spain, Holland, England, USA, UK and Greece, were in a position to offer unique pedagogical perspectives.

Most studio days began with a pinup of each student's work and his or her work is being discussed earnestly and constructively by fellow students and the instructors. As with all studios at University of Nicosia, there is a mid-semester review for all students where the entire faculty is invited as well as guest critics from other universities and professionals. These reviews prove to be an excellent means of coordinating progress in all same-year studios and they provide an opportunity for students to benefit from the experience of a large-scale presentation.

## 3 CONCLUSION

The SDU Studio's primary aim was to introduce the knowledge and culture of sustainability to young architectural minds and to impart them with such skills that would enable them to bring forth a paradigm shift in professional arena. Although the studio's priority was the promotion of sustainable principles, its thematic parameters underwent three basic transformations: its first field of investigation centred on combining conditions of Slow Life with sustainable design, its second was the exploration of the impact of sustainability on quality of life and the third focuses strongly on social sustainability. This transformation allowed the studio's activities to remain current and meaningful.

Also crucial to the Studio's development was the transition from a specific site, common to all students, to the freedom of each student selecting their own site, based on their own interests and

ambitions. The third transition was the movement from a structured assignment regime to a more flexible, but equally demanding schedule with far fewer structured exercise.

If the degree of success of the Sustainable Architecture Studio is measured by students' enthusiasm, then the Studio has surely been a triumph. During the course of two years taught, the students gradually became committed to the Studio's culture, as evidenced by the quality of their finished product, the degree of collaboration inspired among the group and the close bond fostered between the students and the instructors. Although the Unit extracts particularly hard work and dedication, a number of students who were not originally assigned to it, have consistently been requesting to transfer to it.

A diversity of thematic projects were taken on such as skate board and cycling facilities, urban safety, sustainable historic restoration, a dog park, a performance park, an educational centre, etc. A variety of subjects were tackled, including modularity, appropriate water purification technology, flexible occupancy and space reuse and issues of embodied energy. The Studio's standards were kept at a constantly challenging level and as a result, small number of students who were not able to keep up had to withdraw. Although all help was made available to them, the students decided on their own accord that they had more to gain by repeating the studio year.

The students were not only able to produce mature projects touching on all basic issues proclaimed by the Studio agenda, but most of them were able to greatly improve on their overall ability to solve complex architectural spaces and successfully present them in professional drawings and impressive computer renderings. This was partly the result of the instructors' perseverance and insistence that students should be handled as adults who are but a heartbeat away from professional employment.

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