

Design with nature and design for the people - the principles of architectural education

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ABSTRACT: The Chair of Housing Environment is a subdivision of the Institute of Urban Design in the Faculty of Architecture at Cracow University of Technology, Kraków, Poland. Over the years of teaching Introduction to Architectural and Urban Design and Design of Single-Family Residential Architecture, the leaders of the Chair of Housing Environment have developed curricula emphasising the relationships between nature, users and the built environment. Also, extracurricular activities are undertaken by students, such as practical workshops, consistent with the unit's vision of architectural and urban design. During last year's architectural course, the Chair as always invoked the principles of sustainable design, creating a symbiosis between technology and nature. The curriculum was developed to favour site-specific and user-oriented designs. Each year, one of the aspects of the relationship of design to nature was accentuated, e.g. the use of natural light or vegetation or water.

INTRODUCTION

Architecture reflects the contemporary needs of society which, experience shows, constantly change. No matter whether buildings, designs or visions are considered, they need to address up-to-date problems. Architectural education should provide tools for identifying and analysing such issues and encourage students' designs that address them. One of the fields of research is the relation between architecture and nature. Architecture is considered the only field of art that refers directly to nature, since the works of architecture are within nature. When reviewing the historical relationship of architecture and nature, the current attitude to nature represents a return to the original utilitarian role.

Nature once served to meet the basic human needs of food and shelter. The Renaissance restored nature to man in that, once again as in ancient times, it was treated as a source of aesthetic experience. The garden has become an integral part of the house creating separate, open spaces of pleasure. The turning point in the relation of architecture to nature was in the 17th Century. The natural landscape was perceived as wild and disordered, in contrast to the *controlled and orderly* nature of man. From the 19th Century, architecture and nature have formed a relationship that aestheticises everyday life. Nature has ceased to be in opposition to the human environment and is considered a social good.

NATURE - A MATERIAL FOR SUSTAINABLE ARCHITECTURE

The role of nature has changed in history, from strictly utilitarian in primitive cultures to purely aesthetic, through to modernity, which combines both roles. The goal of a building is to have visual values and to support the operation of the building. The elements of nature, understood as compositional elements for architecture, are not only an aesthetic complement, but are also used practically. Architects and urban planners over the years have emphasised the role of natural elements in shaping spaces. Tolwiński stated that the urban and landscape composition affects the harmonious coexistence of man and nature, and lists four basic natural factors that shape the face of the natural landscape, viz. terrain, light, air and vegetation [1].

Wejchert focuses on the elements of nature as building blocks or basic components of urban enclosures, viz. floors, walls and ceilings [2]. He mentions water, greenery and the topography of a floor as natural materials in shaping the composition of urban spaces. Attention is also directed to daylight in the context of interior lighting and the use of chiaroscuro, which he considers a compositional element. He emphasises the value of the variability of nature, understood as elements of vegetation in the urban landscape and as an asset in the composition of urban interiors. Ando lists the four elements of nature, viz. water, wind, light and sky. It gives them meaning in constructing an architectural image as a real work and not just an expression of an abstract idea [3]. He states that these elements take architecture from an ideological plane to reality and bring it to life. He does not treat nature as a material for buildings, but ascribes to the elements a compositional role in the dynamisation and humanisation of architecture.

Natural Elements in Architectural and Urban Design I

The natural elements of composition provide a theoretical background in the design studio of Architectural and Urban Design I, led by Professor Waclaw Seruga during the third semester of the Bachelor's degree at the Faculty of Architecture, Cracow University of Technology. During this course, students obtain skills related to the development of an architectural and urban design of a comprehensive complex of single-family residential buildings in a given location. In order to perform their final design, they undertake a multi-aspect urban analysis to formulate a functional and spatial conceptual design of the residential complex. One of the most important parts of the analysis is the identification of the natural resources at the location [4]. The students are equipped to complete this task by Introduction to Architectural and Urban Design Theory, led in the first semester of their studies by Professor Grażyna Schneider-Skalska DSc PhD Ing. Arch., leader of the Chair of Housing Environment. The education process is divided into three thematic blocks:

1. The design of urban spaces; the structure and perception of a city; urban analysis - its objective, methods and tools; hierarchisation of urban spaces - public spaces, social spaces and private spaces; design of square-type spaces; the contact between a building and its surroundings - elements of circulation.
2. Sustainable design; architecture versus nature; sustainable building; modern architecture and the principles of sustainable design; outline of the history of garden design; regeneration - examples of built projects.
3. Introduction to the shaping of the housing environment; the status and role of residential buildings within the structure of a city; environmentally friendly urban complexes; the housing environment of the 21st Century [5].

The design studio within Introduction to Architectural and Urban Design provides the theoretical knowledge to implement the conceptual design of a small sustainable building, showing the relationship between architecture and nature, e.g. rainwater collection, alternative energy sources, local materials and recycling, green roofs and walls. The students work with models and drawings including a floor plan and cross-sectional views, as well as schemes and diagrams of sustainable solutions, all supplemented by written documentation.

SHAPING A HEALTHY HOUSING ENVIRONMENT

Social awareness of the consequences of the uncontrolled growth of cities has promoted sustainable development. Contemporary ideas aimed at improving the environment must take into account the quality of the environment as a place of human residence. Concepts to improve the urban environment date back to antiquity. The natural human need to coexist with nature led to green spaces in urban areas, e.g. in ancient Rome there were private and public gardens planted within the city [6].

Until the 19th Century, there was a lack of care for green areas within cities. Those that existed were treated in a purely utilitarian way or even encroached upon by urbanisation. The beauty of the city was perceived in its relation to the landscape, not in its interaction with nature. However, utopians, in assessing the state of the urban environment, caused significant changes. The 19th Century saw the search for the ideal city as a healthy place to live. The most important movements were Sir Ebenezer Howard's garden city; the linear town (*Ciudad Lineal*) of Arturo Soria y Mata; and Tony Garnier's industrial town (*Une Cité Industrielle*) [7]. Today, new solutions are being sought. One idea is a contemporary garden city consisting of garden houses. As Bolesław Stelmach states:

Building houses grows out of thinking about contemporary houses in a post-contemporary way. From thinking about the meaning of living in homes and cities. This kind of building gives an idea of the possible (impossible?) future of cities, which, as gardens composed of houses, will open to everyone access to the boundless variety of beauty and goodness [8].

IN SEARCH OF A CONTEMPORARY GARDEN CITY

The Architectural and Urban Design I team consists of Patrycja Haupt, DSc PhD Arch., Elżbieta Kusińska, PhD Arch., Maria Lubelska, PhD Arch., Zbigniew Kęsek, PhD Arch., Jarosław Huebner, PhD Arch., Piotr Celewicz, PhD Arch., Piotr Broniewicz, MSc Ing. Arch., and is led by Prof. Waclaw Seruga, DSc PhD Arch. During the third semester of the Bachelor's degree, students are encouraged to search for innovative designs to meet contemporary housing needs.

An architectural and urban design studio, named Design of Single-Family Residential Complexes, features the tasks associated with nature and user friendly architecture. It emphasises the problems of contemporary residential units, such as energy efficiency, food production, natural light, social spaces, greenery and water. The educational process includes:

- a site analysis and urban design including conceptual design sketches;
- 1:500 scale urban conceptual design of a single-family residential complex;
- three-dimensional representation of the complex;
- 1:200 urban and architectural design for about 20 to 40 houses.

The architectural design covers:

- an architectural conceptual design of residential buildings in a dense layout, e.g. terraced, atrial, grouped, semi-collective;
- design of one unit of houses featuring floor plans for all storeys with distinct cross-sections and 1:100 facades presented as a hand-drawn perspective view;
- a technical detail drawing in the form of a 1:20 vertical cross-section of an external wall of a building (from the foundation to the roof).

The material produced includes [9]:

- schemes and diagrams produced by the technologies used in the design;
- write-up of the design presenting the idea and design solutions including an essay on the chosen problem and technical documentation;
- CD with a digital version of the design [9].

Examples of the outcomes of this course are shown in the pictures below.



Picture 1: *Wqwozy Housing* by Tomasz Obara, Architectural and Urban Design I. Group led by Patrycja Haupt, DSc PhD Arch.



Picture 2: Another visual perspective from *Wqwozy Housing* by Tomasz Obara, Architectural and Urban Design I. Group led by Patrycja Haupt, DSc PhD Arch.

The course aims to familiarise students with the principles of urban composition. A project is undertaken across various urban and architectural scales leading to the development of an urban and architectural design of a detached single-family house within an urban and open landscape. The relationships between nature and architecture are emphasised. Critical evaluation and rational argumentation skills are developed during the decision-making process involved in providing solutions for a sustainable design. The principles of the design are transferred to the students during parallel lectures led by Prof. W. Seruga.

Theory of Architectural and Urban Design; Design of Residential Architecture I; and the Design of Single-Family Residential Complexes studio prepare the students for the design of dense compact complexes of single-family residential buildings and low-rise residential buildings with a high floor-to-surface area ratio. These can feature various types and sizes of buildings. The shaping of the housing environment in terms of ecology across the complex and the individual home in accordance with the needs of users is emphasised. The main design strategies are presented, such as energy efficiency, economic aspects and open plan design. Attention also is drawn to the inclusion of regional cultural features in contemporary urban and architectural solutions [10]. See pictures below:



Picture 3: Aerial perspective from *Housing Complex in Mistrzejowice* by Katarzyna Mierzwińska, Architectural and Urban Design I. Group led by Patrycja Haupt, DSc PhD Arch.



Picture 4: Ground perspective from *Housing Complex in Mistrzejowice* by Katarzyna Mierzwińska, Architectural and Urban Design I. Group led by Patrycja Haupt, DSc PhD Arch.

In semester four, the Design of Single-Family Residential Architecture studio explores the important issues of the coherence of newly designed architecture with the landscape. This features a design task *House within the Landscape* and includes [11]:

- 1:500, 1:250, 1:200 drawings of the placement of the building within its complex;
- 1:50 floor plans of all storeys, including the plan of the ground floor featuring elements of the site development plan;
- 1:50 characteristic cross-section;
- 1:50 elevations with the landscape in the background;
- a selected fragment of the arrangement of the interior (in the form of a rendering or model);
- perspective, axonometric view or 1:50 floor plan;
- hand-drawn perspective view of the building within the landscape.

A ten-page write-up is produced explaining the idea behind the architectural solution, and the structural and material solutions featured in the design. A CD is also produced with a digital version of the project.

SUMMARY AND CONCLUSIONS

The educational process examines the significance of the functional and compositional elements of nature and their impact on shaping contemporary urban spaces. An architectural design should start with the assumption that natural compositional elements have a substantial impact on the relationship between the building, its surroundings and the environment. The introduction of natural elements, such as earth, greenery, water and climate is important in shaping a friendly and healthy living environment. Natural elements in the urban environment, as well as modern technologies and materials, should be used in supporting both eco- and energy- efficiency; thereby, contributing positively to human health and well-being.

The aesthetic value of the natural elements of a composition are undeniable. The psychological need for a relationship between man and nature makes such natural elements desirable components in architectural and urban planning. Their special feature is variability, i.e. variability of the seasons and during a day with various lighting and weather conditions. Hence, these natural elements add a unique dimension to a design.

The number of possible designs satisfying a set of requirements is very large. Natural elements of composition act directly to enhance comfort by improving the thermal and humidity conditions, as well as indoor air quality. They also create a friendly space encouraging social contacts and producing an inspiring aesthetic experience. Therefore, students should be encouraged to search for new possibilities for creating residential environment by taking from nature.

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