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A Methodological Approach to the transference of Knowledge

López de Asiain, María; Echave, Cynthia; Fentanes, Karla

Architecture & Energy. Seminar of Architecture and Environment

School of Architecture of Barcelona. Polytechnic University of Catalonia
Av. Diagonal, 649. E-08028 Barcelona. Tel +34 93. 401.64.21 fax +34 93.401.64.26
Mail: mlasaiain@yahoo.com ; cechavemtz@yahoo.com ; kfentanes@ya.com

Abstract

The teaching methods in architecture –especially in the sphere of design- are usually focused in a partial way and are later drawn together creating a disintegrated solution. When we face teaching in terms of architecture, environment and sustainability, a necessity of new holistic approaches that allow us to develop its complexity arises.

The introduction of the study of matter and energy streams within architecture demand a new focus in the teaching of the design process. The following article exposes a possible methodology of transference of knowledge that combines the structuring and analysis of such streams and the perception of the spatial, cultural and climatic situation of the place of the project we are working on.

In order to do this, the methodology combines a series of theoretical interdisciplinary lessons with practical workshops at different scales. It takes into account questions ranging from partial problems to the totality and complexity of situations. These scale shifts allow the student to develop a more complete perception of the problem and of its intrinsic complexity.

Conference Topic: 10. Education and Technology Transfer

Keywords: energy, comfort , architectural education, environmental education, sustainable education

INTRODUCTION

In the subject of architectural project the student develops the capacity of design architecturally. Because of it, it is necessary that the environmental sensibility transmitted to the student during the teaching should be also part of the desingn teaching, in order to allow the know-how acquired be summarized in concrete and adequate architectural solutions.

It is understood as teaching strategy the communication procedures used by an expert person on certain issue to transmit efficiently that knowledge to inexperienced people.

This communication arises the generation of a concept model that pretends to represent the productive process analyzed, for that, it is necessary a certain technical knowledge, which is the same one that we want to be transmitted.

The conceptual models are always complex because of the architectonical constructive process complexity. For a conceptual model to be sufficiently efficient in its representation of the reality, in our case, the building construction, should present clearly the following aspects:

- The aims that want to be reached at the end of the process, and the criteria values to judge them,
- The available media to reach them, and
- The relation of causality among them, the effects of the aims reached caused by the different media utilized.

In the architecture, the demands and requests are multiple. The different solutions to each request particularly will be able to be beneficial or not for other requests.

Because of it, a good architectural project should find the equilibrium among optimum solutions to the global architectural problematic proposed, exactly by being sufficiently efficient (although in many cases not the most efficient one) for each request and demand particularly.

On this particular case, the environmental and sustainability criteria refereed on the closing of material cycles, turns into new requests in the project process. Therefore, a teaching structure proceeding will be necessary from the conceptual model

configured by the points before mentioned. So, in that way, the aims, media and relations will be defined.

The architecture should reach the following aims:

- The adaptation of its spaces.
- The environmental adaptation of the same ones,
- The convenience of its esthetics and communicative qualities,
- The long term integrity of its physic elements and their occupants,
- The environmental and direct efficiency at the production process.¹
- The closing of material cycles for all its components.²

The environmental adaptation of the architectonic spaces and the environmental efficiency at the production process are the aims that should be proposed for the model on this case we are working on.

The media to apply should be defined from the different knowledge areas, its evaluation of suitability for each aim and concrete case, and its causality respect to likewise relevant aims on the architectonical projected development (before mentioned).

It wouldn't have sense to include on architectonic teaching the environmental instruction as quantitative solutions in energetic terms or the election of materials and constructive systems, more or less ecologic and sustainable. Indeed, it should be proposed as the space conception that allows an adequate control of the energetic and constructive conditions, even the esthetics of the building.

For these reasons, one way that opens from the sustainability concept³ (more extended concept than the environmental one, as was mentioned) is the control and closing of material cycles in architecture. This needs initially an environmental sensibility, until reach it, it could be proposed a greater scale challenge.

A global conception of architecture should be always present in our teaching model in order to be considered as a right and efficient model.

"The partial" wouldn't be over "the global". That is the way the conceptual model proposed for each subject wouldn't give concrete solutions, but fundamentally, it should give values criteria that allows the designer, on one hand, to know how to

¹ "Las estrategias docentes de la construcción arquitectónica" José Luis González Moreno-Navarro, Albert Casals Balagué. Informes de la Construcción. Vol. 53, n. 474 (jul-ago, 2001), p 5-19.

² Albert Cuchí Burgos, Ambientalització Curricular del Departament de Construccions Arquitectòniques I de la UPC
³ See: Albert Cuchí Burgos, Ambientalització Curricular del Departament de Construccions Arquitectòniques I de la UPC

propose the problems on the right way, and on the other hand, to know how evaluate the existents solutions, and choose the better option for the group of request and adapting it to the case he is working on.

Anyways, in order to build or realize an environmental architecture, and in last term a sustainable one, any conceptual model proposed should be coming from an ecological sensibility that imply a respect for the natural context that surround us.

Then, the technical knowledge transmitted outcomes efficient on the use or resources and provides comfort and habitability conditions to the architectonic space. Because of the methodology used in the teaching of the environmental themes in the different areas of knowledge that conform the teaching of the architecture should adopt models that include the following criteria:

- Respect and introduce the three R principal, reducing, reutilization and recycling
- The respect of nature will be proposed from the consequences of any kind of architectonic decision.
- The physic-psychology comfort should be the last aim of every approach, that is to say, the habitability set against another type of architectural criteria will predominate.

The knowledge transmitted will be developed inside the framework of the closing life cycle of materials.

1. THE SPECIFIC CASE OF THE ARCHITECTONIC PROJECT

All the theory knowledge should flow to the architectonic project, permitting its enrichment with the introduction of criteria and conditionings of sustainability.

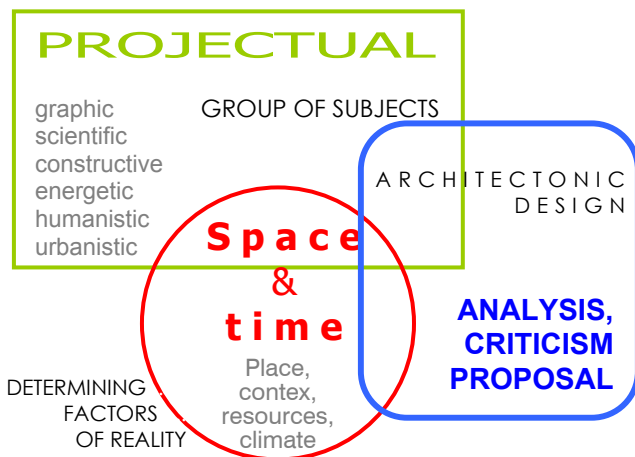
The architectonic workshop wouldn't be understood only as an experimentation set of current esthetics and composition tendencies. But it should provide the dialogue among the different knowledge acquired that will configure the design project in unity and global terms.

In order to guarantee the correct teaching of this subject is necessary as well to assure the professional training of the teachers related on the capacity to integrate the project and technique knowledge. It is to say, with specifics knowledge on scientific development, technologic and instrumental issues.

As was mentioned before, every teaching program for architecture school is developed on subjects included on the following groups:

- GRAPHICS (geometric, proceedings of expression, analysis of architectonic elements, architectonic projects, design, etc.)
- SCIENTIFIC (music, mathematics, physic, etc)
- CONSTRUCTION (construction materials, project technology, construction, structures, ground mechanic, etc...)
- ENERGY (installations, electrotechnic and lighting, techniques of conditioning, etc. ...)
- HUMANISTIC (history, theory of the architecture, esthetics, architectural composition, etc. ...)
- URBAN DEVELOPMENT (town planning, gardening and landscape, etc. ...)

These, configures the foundation where the environmental criteria are developed, directly developed from the determining factors of space and time (place, resources, context, climate).



Graphic, relations between subjects and architectonic design process.

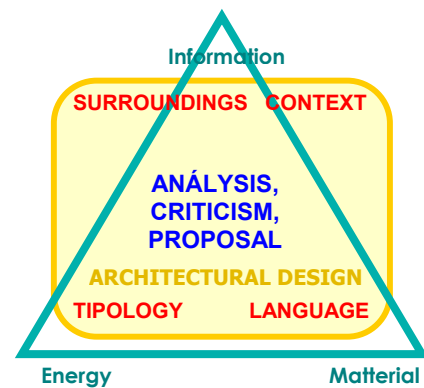
The development of an architectonic project should be planed as analysis of the project situation, a critic attitude that comes from the ecological and sustainable conscience and an architectural proposal that satisfy the conditions of comfort physic and psychic, and assure the habitability of the solution adopted.

Any project development should count with the following points: Environment; Context; Typology; and Language.

- Environment. It marks the physical environment where the project writes down, the orography, topography, the macroclimate, microclimate, orientation,

shadows and I bask, contamination, noises, views, volumes, masses, scale, etc.

- Context. It marks the historic, cultural and anthropologic environment. It considers customs, historic situations, cultural meanings, tendencies, anthropologic characteristics of the society, etc...
- Typology. It studies the architectonic form and composition, the uses and functions that the building typologies configures and the type of urban space created, the type of city, its structural relations, etc...
- Language. It studies the architectural languages used, materials, composition criteria, texture, color, esthetic, formal systems, styles, constructive systems, etc.



Graphic, Architectonic design process.

It is interesting to emphasize the relevance of the climate compared to other factors, not to exclude them, but only because in some way, it includes them. Historically the climate has defined matterial, architectural types, constructive systems, historic, cultural customs, and finally, ways of life.

For these reasons, humidity conditions, tempereture, shining, raining, wind, etc. are fundamental to understand the own idiosyncrasy of different societies, just as Vitrubio already comments in his book VI, chapter I.⁴

These four points define the basement where the architectonic project have to be supported in order to respond the **habitability and comfort** criteria in both physic and psychology aspects.

Then, all the environmental conditionings coming from them will appear.

⁴ Marcus Vitruvius, De Arquitectura. Ediciones de arte y bibliografía para Unión Explosivos Rio Tinto SA. Madrid 1973.

In the correct reading of situations and correct utilization of specific know-how in scientific, technological and instrumental fields of development, will be the conclusion of a project of environmental architecture according to sustainability criteria.

2. METHODOLOGIC PROPOSAL OF PROJECTUAL TEACHING.

The teaching methodology that is proposed on this paper permits the gradual approach to the environmental concepts that want to be incorporated in the teaching of the architectural project.

This produces an interdisciplinary development of itself, with the incorporation of different functions along the time from the different disciplines that can concur in the project. This way of working makes possible the exchange of ideas coming from different professional perspectives and integrating the concepts that want to be transmitted in the resolution of an architectonic form.

On this way, the architectural project is presented by means of two kind of complementary exercises:

1° *The Thematic Exercise* is planed to pick up information and develop the key subjects of the course, in order to get relevant information related on systems and techniques to plan adequate strategies for the project on each subject. Teams of 5 persons each can be developed for each of the seven subjects to present, giving a chance of working on the subject on which they are interested because of professional relation or personal and particular interest.

These are the subjects treated on the thematic exercise:

1. *The place.* The territorial location of the program elements, their relations with other elements of the context such as productive ones, climatic ones, resources, landscaping, accessibility, cultural etc, are key aspects for the possible strategies of the architectural program placement for any cultural or environmental context. The objective of this thematic development is to stand the possible strategies related on the context, the limitations and the way of positioning to be congruence with it.
2. *The materials flows.* The development of the project program requires the consideration of very different kind of materials – utensils, food, furniture, etc... that should be listed to determine its utility, to count and to establish the possible techniques and systems to resolve them, ordered according to the coherence between the material cycles and

the diverse strategies of the architectonic project and its relation with the environment.

3. *The program.* Related on the debate of the articulation of needs, the program is necessary to define on a qualitative and quantitative way, the type of spaces and their functional relations, as well as the relation between the physical an social context that surrounds it.
4. *The Water Management.* It is very important in the architectural project the recovering of water, the use of it and the return to the environment in a non destructive way or in a recupetaion by the environment way. The objective of this theme is the cuantitative and cualitative mesure of the diferent ways of using water and the technics employed for it. It will be necessary then to group the different technics adecuating them to their relation to the environment.
5. *The construction materials.* The objective of this thematic is to collect information of technique systems to solve the different parts and subsystems of the buildings projected, ordered according with the validity of the different strategies in relation with the environment, as well as description of qualities and process, quantity of materials and strategies for closing their matterial cycles.
6. *Climate characteristics.* The specific climate conditions of the location where the Project will be placed on requires its characterization of parameters that allows to understand the environment corrections -in the inside and outside - that architecture should provide to the program uses. This subject wants to parametrize the climate, making environmental profiles of the different stations and hours of the day. As well, it proposes the precisely corrections and the bioclimatic strategies that could be used.
7. *The energy.* This subject define the uses and quantity of energy required for the development of activities considered on the Project. It should remark different possible sources of support and the management of materials and systems that provide them, considering for each case, the congruence to the planned relation on the global context and the sufficient precision to determine the viability of the proposal for each project.

2° *The Project* of intervention on the territory means the development of a strategy of placement on the right place, at first project level.

Every group of project develops the strategy for each subject presented on the thematic exercises. On five groups of seven persons (depending on the number of people of the teams created previously) each one of them have study deep and previously one of the subjects of the thematic exercises permitting to suggest them specific criteria of his specialization.

3. CONCLUSIONS

The methodology of work mentioned promotes and expires on one hand the interdisciplinary work, and on the other hand, allows the gradual approach to environmental themes from the different fields. Finally, it ends on the global architectonic project where the group of premises and problematics configure a proposal that solves the management of resources on efficient way, and reach the comfort conditions searched.

This way, all the architectural design works will advance thus towards a bioclimatic resolution and sustainable way of solving the problems presented.

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