Chapter 19

Architectural Design Education and Parametric Modeling: An Architecturological Approach

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ABSTRACT

This chapter presents an original teaching method carried out at the School of Architecture of Paris La-Villette (ARIAM-LAREA) whose aim is to prepare future architects for parametric design. Unlike most of the parametric design studio, the authors of this chapter do not want to teach a specific design method. They believe that the students have to find out their own method from the knowledge of architectural usages of parametric design. Theoretical courses linked to a studio will better train them in the usage of parametric tools. During theoretical courses focused on parametric design activity, the authors ask the students to analyze computer activities of architects in order to identify their design methods. The students are trained under a method to analyze design activities based on “Applied Architecturology.” During the studio, they ask the students to reuse the identified methods. The students apply the methods in their own project and adapt them in order to build their own parametric design method. The works produced by the students in the courses and in the studio bring up new questions for the ARIAM-LAREA research laboratory and constitute bases for the development of new software tools for parametric architectural design.

INTRODUCTION

Parametric modeling has been taught in several architectural design studios all over the world. But generally the parametric modeling is viewed as a component of a design method being taught to students. These design methods are most often focused on sustainable design or CAD/CAM technologies.

When the design method is focused on sustainable design, the teaching objective is to teach the possibilities of the parametric architectural design...
especially for adapting the shape to climate conditions or designing building shape inspired by forms and structures of the nature (fruits for example) (Matcha 2007). Generally, parametric modeling tools are used in conjunction with environmental performance evaluation tools (Holzer 2008).

When the design method is focused on CAD/CAM technologies, the teaching objective is to provide an in-depth understanding of the CAD/CAM technology and to convey how it can be applied in current architectural design practice (Bechthold 2007; Karzel and Matcha 2009).

The same teaching methods are commonly used. The students are first trained in using tools required by the design methods (parametric modelers, environmental performance evaluation tool or CNC manufacturing devices) and in how to communicate data between these tools. The teachers of the studio provide this training or, sometimes, appeal to expert competencies outside the studio. Often the training staff of the developer or vendor provides the training but consultants can be also found across other academic institutes. Sometimes, before this training, teachers of the studio provide preliminary course for introducing parametric modeling software, the use of parameters and their impact on the geometry.

When they have been trained to use the tools, several progressive exercises are proposed to students for learning the methods before designing their own project. The teachers propose appropriate methods by designing small objects (pieces of furniture for example) or small-scale architectural projects (Holzer 2008; Matcha 2007; Spaeth 2007).

This chapter presents an original teaching method carried out at the School of Architecture of Paris La-Villette (ARIAM-LAREA) whose aim is to prepare future architects for parametric design. Unlike most of the parametric design studio, we do not want to teach a specific design method. We believe that the students have to find their own method.

This teaching practice jointly uses two didactical methods: Teaching and training. Teaching is carried out in theoretical courses of the postgraduate program and training in a studio at the same level of studies. Architecturology is taught in the theoretical courses as basic knowledge on the architectural design and as an introspection and verbalisation method for analysing the architectural design activity. The students are led to investigate the functionalities of software tools using parametric modeling techniques in order to find out their potential to assist architectural design. In the studio the students use parametric modeling software tools (such as Grasshopper, Generative Component or Digital Project) for designing their architectural project. We train the students in using parametric tools in specific courses linked to the studio.

The aim of this teaching approach is to lead the students to discover the impact of those software tools on their production and to build new design methods. The works produced by the students in the courses and the studio bring up new questions for the ARIAM-LAREA research laboratory and constitute bases for the development of new software tools for parametric architectural design.

The first part of this chapter explains the specific approach of Architecturology taught in the theoretical courses. Architecturology is taught as an analysis tool that permits exploring design methods of architects. The aim of the theoretical courses is for the students to produce architecturological analysis of design methods in order to develop their own methods of parametric design. The second part presents how we approach, in the theoretical courses, the specific aspects of parametric modeling used by different teams of architects. It testifies our pedagogy and shows how our students explore cases to personalize their own approach to Computer-aided Design (CAD). The third part presents some student productions of parametric design from the studio. The last section or conclusion presents the impact of these experiments on our research and the specifications of a new parametric design tool we are currently developing.