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Construction Teaching Methods: The Exercise(s) in the Teaching of Construction

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Monitoring the Teaching of Construction

Glancing over the architectural literature, it becomes increasingly apparent that in the last two decades, there has been a shift in the complexity of the architectural discourse, in the images of forms representing contemporary trends, in the content of job descriptions for young architects and in the advertisements on new materials and construction methods. The architectural discourse has become more complex in its effort to describe form generation as a process of accommodating the changing needs of a changing and unique being. The emerging architectural images of this mutable form attempt to capture different and unique moments of the experience of this intentionally changing habitation. Architectural practices demand digitally-literate architects who use computers not only to represent but to conceive form from the early stages of the design process. The building industry promotes new mutable materials open to research and construction methods, capable of materialising forms which can best accommodate these changes, be it changes in performance and/or in form. Information technology plays both the role of cause and consequence in this process: cause, in making possible the generation of new forms in the visual vocabulary of architecture, and consequence, in that is becoming the necessary tool for the investigation and elaboration of these forms.

All these issues call for a reassessment of architectural pedagogy which needs to follow, understand and respond to the context in which it has to educate potential architects. The teaching of construction has a fair share in this reassessment process, since construction is the medium or vehicle of architecture, therefore construction teaching has the responsibility of initiating young architects to this new culture while providing them with opportunities to acquire the appropriate skills in order for them to design and construct this new architecture.

For construction teaching to redefine its position in the contemporary education of the architect there is a need for it to reassess itself and to adapt to the aforementioned transformations in the theory and practice

of contemporary architecture. Reassessment can only be feasible if it is preceded by an in-depth analysis of the state of the art of construction teaching. This analysis should operate on three complementary levels: the first one concerning the contemporary content of construction teaching, the second, the qualitative and quantitative position of the subject area in a school curriculum, and the third, the accomplished methods for the transmission of knowledge in the subject area. The Transactions in Architectural Education volume no12 entitled 'The Teaching of Construction in Architectural Education: Current Pedagogy and Innovative Teaching Methods' which was published in 2002, dealt with the first two levels of analysis and touched upon the third. The present volume deals exclusively with the third level.

The Exercise as a Vehicle for Monitoring Construction Teaching

The crucial assumption which defined the investigation into the methods for the transmission of knowledge of construction teaching is that the key-exercises taught can become the vehicle whereby these methods can be best understood. It was considered that key-exercises on construction condense characteristics of the educational process and as such their monitoring could provide an operational tool for the investigation of the various philosophies and approaches to construction teaching.

The emerging question is what a construction key-exercise, or exercise is. Construction exercises can be an application of a course, a specific illustration, or on-site practice. Construction exercises can be closer to the physics exercise or to an architectural design exercise. Most teachers pursue and invent original exercises, which are adapted to the pedagogy of architecture. Some exercises call on science or the theory of elasticity, others require imagination, invention, or experiments....Whatever the type of exercise, its narration can constitute useful material and tool for debate, exchange and study towards enriching the knowledge and experience of a construction teacher. For the sake of the present initiative, 'key-exercise' was defined as the exercise set up and implemented by

teacher(s) as the most representative, central, comprehensive and fundamental for construction teaching.

In order for this monitoring to be possible, four issues were selected to form the basis on which contributors were asked to present their exercises. More specifically, they were asked to structure their presentations on an issue linked to knowledge itself ('explain'), the other linked to pedagogy ('transmit'), another linked to capitalization ('memorise'), and an final one linked to the operational potential of the exercise ('act').

An exercise (or a series of exercises) aims at exposing, exploring and explaining a specific problem, or 'staging' by means of various tricks so as to make the initial problem intelligible. This may involve a simple calculation, like that of a beam for a project, or the design of an original construction principle. Whatever the case, the exercise generally shows and demonstrates something. That is to say, that an exercise always has to **explain**.

An exercise has to also **transmit**. This is often a difficult function to represent, and teachers tend to take it for granted. Yet, any exercise includes a measure of efficacy or even of considerable educational productivity. This is especially true of architecture in which students are strongly conditioned, so to speak, by imagination. One can imagine a thousand ways of inscribing construction laws or rules within the architectural education process.

A construction exercise often appears like a happening, which raises the problem of its memorisation. It leaves no trace but a recollection. A lot of teachers give handouts and bibliographies with their course. But the exercise itself may be designed as a memorisation tool. The learning derived from the exercise should be imprinted in memory. The problem raised is how construction exercises generate their own traces so that students can best **memorise**.

In the teaching of architecture, construction is not a science in itself, universal, abstract and positive. It is by definition 'applied'. The question raised is precisely to know how to apply certain rules or phenomena to do the modelling. How can such phenomena, represented in a certain way, generate a project? What specific energy can the exercise develop in the process of putting it to work? In what knowledge framework does an exercise invite students to **act**?

The Spectrum of Exercises on Construction

Sixty three participants, representing thirty eight European Schools of Architecture responded to the invitation for this monitoring. The exercises submitted offered a diversity of approaches to the four abovementioned issues and their emerging content and philosophy were vast, not far from the expectations of the original call. In every case there was a different emphasis placed on and content attributed to all four issues, a fact that makes an attempt to classify non-operational. Nevertheless, two ends of the spectrum could be sensed.

Exercises of one end of the spectrum focus on the teaching of structures, construction techniques, materials, analysis of existing buildings, etc. These exercises deal with the issue of simulation of the real building process for understanding construction by looking at the designs of buildings based more or less on the existing knowledge of building technology with a fluctuating degree of improvisation, depending on building size or complexity. This is integrated with construction investigation parallel to, or following the design. Along the same lines, several exercises focus on the issue of integration, that is, the exercises that try to articulate design with construction and other sub-categories, e.g. the cases that go from construction to design and vice versa.

Exercises in this direction tend to put their position forward on the basis that it is important for students to understand the significance of an existing body of knowledge of construction or structural design in their architectural building projects by simulating the design process. This approach stages construction education and suggests that experimentation is valid as a specialisation for advanced students who can try things out, after learning at earlier stages in their education about the basics of construction laws, the established methods and limitations. Having gained this awareness is quite a satisfactory step in the education of an undergraduate. Greater specialisation can be obtained at graduate level, where students can work on more sophisticated scientific concepts or be more liberated and experimental. This type of construction exercises intend to teach students how things work today, hoping that through the knowledge of what exists they can more safely conceive new architecture.

Exercises at the other end constitute an approach where understanding of construction develops through themes unrelated to the production of buildings and their design. In these exercises a strong role is played by

metaphor, analogy and the involvement of the body and the individual abilities and experiences, such as the sense of tactility or gut feelings. In this group of exercises problems of form and morphology can act as starting points which aim at generating form through the study and invention of new structural types.

Exercises of this approach are based on the assumption that what architecture students need to learn is how to transcend and go beyond the existing body of knowledge. This ability can develop through experimentation and interest in exploring, investigating, and going beyond existing forms in search of novelty. This type of construction exercises intends to teach students how things work in the realm of the extreme and/or experiential, hoping that through their relation of matter to body and their attraction to impressive and unusual forms they can conceive new architecture.

Debating on Teaching Construction

The exercises that were submitted for monitoring were presented in the form of a poster exhibition at Les Grands Ateliers de l'Isle d'Abeau in the spring of 2003 (15-17 May 2003) which run parallel to the second network meeting entitled 'Construction Teaching Methods: The Exercise(s) in the Teaching of Construction', and stimulated intriguing debates on construction teaching. As in last year's debates, this year it was reinstated that 'construction teaching is no longer peripheral knowledge which, isolated and introverted, articulates a programme of subject modules with an inner logic, its own coursework, committed to assist design whenever necessary. On the contrary, it is suggested that construction should constitute an integral and inseparable part of the design studio not as a contribution to it when necessary, but as an active parameter in the formulation of values and ideas of an architectural proposition and the subsequent decision-making of the design process'. In this year's debates the teaching of construction in the studio was reaffirmed and the possibilities for it to be established as such were discussed. The discussion pointed to the importance of intuition in the teaching of construction for the purpose of understanding and memorising, the use of models to help students understand scale, the work on full-scale constructions and proportions, experimentation through the body, the testing of forces and loading conditions through kinaesthetic experiences, and spatial experimentation through choreography.

Suggestions were made for the definition of new

paradigms or hybrid exercises as a different concept in the teaching of construction. It seems that the changing culture in the education of the architect and the effective production of the built environment call for the anticipation of integrating design and construction, despite the problems associated with integration given the increasing number of students, education cuts and the effective low student/staff ratio. The old paradigm that used to be taught is no longer efficient. These new exercises should "stand on the fence" between the two sides of thinking -design and construction- as a way of keeping pace with architecture. New hybrid exercises will require new teaching methods and techniques which will maintain quality teaching. In other words, the applicable has to be sorted out and alternative pedagogies, appropriate to bigger ratios must be looked into.

It was stressed in the discussion that one of the tasks of a teacher of construction is to enthuse students to appreciate the value of construction in the process of the creation of architecture and develop the intellect to be able to draw connections between concept and materiality, ideas and building. In the debates a great deal of space was devoted to the remark that architectural construction education lacks cultivation of the intellect of architecture student. It was agreed that construction teaching should involve the development of a *pensée technique* or technical thinking, a rather unsuccessful translation of the term in English. That is way of thinking in which construction, technique and material will constitute an inseparable part inasmuch as the understanding of architecture through history as in the generation of new architectural forms. However, it became apparent that there is no easy way that teachers can provide the "lenses" through which students can see and appreciate architecture from the perspective of construction, a conclusion that makes these encounters meaningful.

This new view on construction has to take into account the new information systems and their relation to the creation of architecture as well as the production of the built environment. In an investigation of updating construction teaching by defining its content, methods and learning tools, teachers need to bear in mind that their task is ultimately to teach construction which is sturdier, more effective but above all synchronised with the conditions of life in the 21st century. After all construction teaching is a view of architectural teaching, which reflects our philosophy of architecture, which is in turn a view of society. As a consequence, if architecture is ever-changing then architectural and

construction teaching is ever-changing and construction teachers have to be alert to sense and adapt their teaching to this condition.

Accounts on the Past and Plans for the Future

The perspective of a research project to investigate and define new paradigms seems to be a particularly complex mission. The network of specialists in teaching construction, which was created in 2002 and has developed collaborations and friendships in the academic year, has proven to be the appropriate milieu for offering insights into construction teaching in higher architectural education. The second encounter, as expected was more focused than it was in its first year of operation. What the members of the network definitely share is not only concern for promoting appropriate education pedagogies for a rapidly changing world, but also the absence of a systematic monitoring of construction exercises. This attempt to gather some of them was a particularly difficult task given the numerous proposals but also their heterogeneous departure points (geographic, age, and cultural particularities as well as views on architecture...) and contexts in which they operate. Moreover, it goes without saying that the attitude of any passionate teacher is usually proprietorial and hardly self-critical. It would be more valuable if exercises were presented in a more critical framework, clearly outlining not just their positive aspects but also the problems concerned in their implementation.

It is through the consensus of its members that the strengthening of the network of construction teachers has found a home, as this was proposed by EAAE (European Association for Architectural Education) and the Socrates funded Thematic Network Programme and ENHSA (European Network of Heads of Schools of Architecture). This virtual home continues to act as a supporting environment for the development of research and the amelioration of construction education. The present volume describes this year's work in its entirety and is offered to the reader as proof of commitment of the network members but most importantly as an invitation for cooperation on, and contribution to the future activities of the Network.

The Volume

The present volume incorporates the work developed in the framework of the Construction Sub-Thematic Network in the academic year 2002-2003. The theme proposed focused on construction teaching methods with emphasis on the exercise(s) of construction. This volume is organised in four parts:

Initiations, the first part, consists of the present introduction.

Conceptualisations, the second part, includes two stimulating positions on the subject. The first position was put forward by Pascal Rollet from Grenoble School of Architecture, entitled 'Construction, Experimentation and the Design Process'. The second position was put forward by Jean-François Blassel, from Marne-la-Vallée School of Architecture, entitled 'The Role of Construction and Technology in Architecture and its Teaching'.

Articulations, the third part, consists of the papers that were written by the network members presenting their *key-exercises* in reference to the four issues set up and the posters corresponding to the graphic output, or to the student projects for the exercises presented.

Expectations, the fourth part, consists of the debates on the aforementioned themes. Last but not least, what could be otherwise the fifth part of the network meeting output was the unique experience at Grands Ateliers of witnessing laboratories and model tests from Lyon School of Architecture, which were running parallel to the network meeting. Finally, all parts of the meeting, but most importantly the active participation and the constructive debates of the participants raised very intriguing issues on the teaching of construction.

It is the aim of all members of the Network to meet again in 2004, and interesting proposals have already been put forward whose elaboration is underway for the new theme to be announced.

It would be an understatement to assume that one can summarise in a few lines the rich experience of the live encounter of teachers of construction. With that in mind a conscious decision was made to allow for the individual reader of this volume space for personal interpretations and attributions through the access of the raw material of the encounter.

In this volume it has been confirmed that a great number of schools of architecture in Europe have already started working on shaping and introducing to their curricula this new construction culture. What remains to be examined is the methods which will enable this new paradigm to flourish; the ways in which construction knowledge itself is explained and transmitted to, and memorised by students, as well as the ways in which the operational potential of a construction exercise is ensured.

By committing itself to meet in the spring of 2003 to thoroughly examine these methods, the Network demonstrated its appreciation and acknowledgement of the operational value and importance of this encounter in its efforts not only to strengthen a network of construction teachers but to advance the pedagogy of the subject matter.

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