

Visions for the Future of Construction Education: Teaching Construction in a Changing World

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The EAAE-ENHSA Construction Teachers' Sub-network had its first workshop in May 2002. Construction teachers from many European schools of architecture presented and discussed the content of construction teaching and its role in the framework of European contemporary architectural education curricula. In May 2003, at the second workshop of the Network, the discussion focused on teaching methodologies using as vehicle to approach the subject individual presentations of key construction exercises taught in more than forty schools of architecture around Europe. Both of these two workshops contributed to formulating a clear view on the different versions of contemporary construction education offered to students by European Schools of Architecture. Both of these two workshops contributed to answering the question of 'where we are' with regard to the teaching of construction and to the competences this teaching can ensure our graduates.

The theme for the third workshop of the Construction teachers' Sub-network emerged from the question of 'where we are going', as a direct result of the debates held at the previous workshop. Consequently it was agreed by the participants that such a question could become an interesting platform to investigate the future of a competent construction education in Europe. A construction education sensitive to the rapidly changing values and attitudes of our contemporary culture; responsive to the needs created by the transformations of our daily lives; alert to the incredibly fast development of technological possibilities and infrastructures; conscious of the tremendously rapid transformations of the logics and the ideas which generate contemporary architecture; attentive to an increasingly unstable labour market and a more highly specialised professional practice; informed about the amazingly wide range of brand new construction materials and techniques; aware of the deterioration of the environment and of the imperative necessity for a built environment, less energy-consuming and more sustainable, but always sensitive to the traditional values of the act of building and insightful as well as respectful of the historic roots and cultural richness of the construction culture of a place.

The main objectives of the Third EAAE-ENHSA Construction teachers' workshop entitled 'Visions for the Future of Construction Education: Teaching Construction in a Changing World' were to investigate the extent to which the teaching methods and practices we are actually applying in our schools to educate students in construction are able, to effectively and efficiently cope with the new demands imposed by a fast changing world; to inspect whether with the construction education we offer them, our students are ready to handle successfully their professional life in a demanding, competitive and extremely unstable profession; to scrutinise if our teaching strategies, knowledge and methods are really as diachronic and time resistant as we think, or whether it seems necessary to re-think their values and objectives, to re-formulate their structure and contents and to re-structure the means and the techniques of their transmission. Moreover, to reconsider the limits of our teaching responsibility in light of the not very rare remark that construction is far from being the favorite subject of our students, or in light of the not so rare frustration that governs our graduates when undervalued and intimidated at the start of their professional careers due to lack of the necessary competences in contemporary building production.

The aim of the Workshop was to capitalize on previously gained experience by nourishing it with the visions for the future of construction education in Europe. **In other words the workshop aimed to facilitate the transition from present facts to future possibilities or from 'where we are' to 'where we are going'.**

As a vehicle for this facilitation two parallel and complementary topics were proposed.

The first one concerned the expected profile of young architects after graduation which would allow them to confront the world of architectural practice in a changing society where common demands tend to be subjected to constant reformulation. **The competencies and skills** or essential requirements provided through construction teaching to effectively work in the real and changing world.

The second topic concerned **the educational methods** that would ensure the acquisition of these competences and skills. In other words the ways (teaching methodology as well as structure of courses) in which the competences and skills of a graduate could be ensured.

As in every year, the workshop was debate oriented. Participants were invited to contribute to the debates, to present their views, ideas, experiences and proposals on the two above-mentioned topics.

Five keynote speakers enhanced the content and debates of the workshop. Namely, Dimitris Papalexopoulos, from Athens School of Architecture started off with a lecture entitled 'Teaching Construction for the Transformable', followed by a lecture entitled "Digital Tectonics – Design and Fabrication of Gridshell Structures", by Chris Williams from Bath School of Architecture and Civil Engineering, UK. The second day opened with Cyrille Simonnet's lecture "New' Materials and 'New' Architecture: New Uncertainty", from Geneva Institute of Architecture, Switzerland and closed with Ed van Hinte from the Hague, the Netherlands whose lecture was entitled 'Smart Building'. Last but not least, Bjorn Sandaker from Oslo School of Architecture, Norway delivered a lecture entitled "Designing by making: Strategies for Developing Architectural Concepts by means of Process Skills".

The debates were organised in workshops dedicated to each of the two topics (competences and methods) in conjunction with the following four themes:

- Theme 1. The Teaching of Construction and Contemporary Architecture,
- Theme 2. The Teaching of Construction and the New Materials and Techniques,
- Theme 3. The Teaching of Construction and the Environment, and
- Theme 4. The Teaching of Construction and the Rare and Traditional Knowledge

The four themes were tackled autonomously and independently of one another and were organised around four respective sessions. Their synthesis however occurred in the final conclusive session.

More specifically **Session 1 entitled 'The Teaching of Construction and Contemporary Architecture' posed the following questions:**

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be capable of following the attestations and changing trends of contemporary architecture, the architecture that charms the students of today?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of following the attestations and changing trends of contemporary architecture, the architecture that charms the students of today?*

An emerging question that constituted the focal point of the debates in the Workshop was whether a new architecture would demand new construction techniques, which would involve redefining teaching methods, content and creating new subjects. The reason why the session primarily focused on new architecture was that the attestations and changing trends of contemporary architecture, represent the architecture that charms the students of today, which is a reality that both design and construction teachers have to come to terms with.

What teachers identify as a strong characteristic in contemporary architectural projects and even more in their digital approaches often discuss the shift from an 'assembly kit of parts' as this was associated mostly with the Modern Movement to 'the desire for formal variation and uniqueness' associated with the new paradigm. From the debates it became apparent that there was a degree of concern regarding the information management of new technologies in view of its continual input and speed of transmission, which although contributed to easy access or availability, it was felt that it required teaching or teacher mediation in order for the information to result in the kind of knowledge or tool that students can use or apply accordingly. This, understandably, was perceived as a tremendous challenge for teachers without underestimating the difficulties involved in keeping abreast of new developments. Strategies based on individual experience were suggested, including a shift of paradigm from 'what to teach' to 'how' and 'why', thus a move from content-based teaching to process and research-oriented teaching. Furthermore, Prof. Papalexopoulos asserted that professionals, practitioners and academicians have an important new role to play in structuring, contextualizing and organizing databases for learning purposes, which certainly puts them in

control or give them a better grip of the infinite knowledge base educators are expected to possess. In addition, there was a general consensus that teachers undergo constant self-evaluation in the form of 'benchmarking' as suggested by Prof. Tzekakis.

The answer to the question of whether a new architecture demands a new construction pedagogy could be found, for a number of participants, in the change of attitude of construction educators. The norm to teach certainties in construction pedagogy, a well founded tradition, is no longer appropriate as argued by Prod. Gamelgaard. Construction teaching has to come to terms with teaching uncertainties in the same way that contemporary design teaching does. To achieve that it was suggested by some participants that the starting point to investigate the unknown is to give up images existing in the mental stock of students. Hence, according to them, one of the tasks of construction teachers is no longer limited to teaching of basics in construction but is primarily based on teaching students how to experiment. Teachers have to teach their students how to learn by finding out for themselves. This idea is supported by the fact that contemporary examples in built projects have shown that innovating when anticipating the materiality and constructability of a concept strengthens the concept itself (Prof. Melet). This premise alludes to a more profound discussion of the interrelationship between theory and practice or concept and materiality, which is what the new paradigm is trying to introduce. The design studio seems to be the catalytic milieu for this coexistence. However, as the controversy -between those who believe that construction should teach the basics as opposed to those who believe that construction pedagogy should teach the research of the unknown- seems to have no winner a school curriculum must strike the balance towards accommodating the two.

On this premise, the emerging question was on the adequate profile of the teacher who can best serve the purpose. Two schools of thought surfaced. The one suggested that by bringing external consultants the gap could be bridged. The other one challenges the question of who can actually help by focusing on the existing teachers but with a change of attitude.

As a result of the debates on the question of how we tackle construction education given the infinity of knowledge base, a school of thought proposes the involvement of consultants from practice to help teaching with their expertise, a simulation of what

happens in real architectural practice. This view has its opponents and the explanation lies in the fact that ordinary consultants who happen to be conservative due to their compromising with the limitations imposed by reality could inhibit students' imagination. Moreover, the involvement of external consultants in the studio seems to make some educators feel uncomfortable as they see a threat of being substituted and downgraded to part-time teaching staff, a development that might deprive the studio from the full-time confirmed teacher profile (Prof. Shotton).

However, some educators seem to be protective of their premises and do not wish to involve the building industry as they believe that research is genuinely rooted in education and not beyond it and starts at an early stage of education, not at post-graduate level. There are however supporters of the opposite view who in fact believe that novelty which is primarily a result of research in the building industry is what legitimizes and necessitates the feedback from industry's research output in construction pedagogy.

Encouraging of imagination in school seems to be a necessary skill students should acquire to be able to be in the forefront of the contemporary architectural scene.

The fear expressed lies in the fact that fascination transpired in the new paradigm might threaten the teaching of the basics. This discussion splits construction teachers into two opposing camps, with a moderate one between the two. The first one suggests that construction teaching has to teach students to dare experiment, to pose valid questions and to learn how to find the answers. This view clashes with the second one which suggests that a school curriculum has to concentrate on the teaching of the basics, whilst the third view suggests that a balance should be achieved between the teaching of basics and experimentation. In the debate, construction teachers with an engineering background suggested that the work of a multidisciplinary team is necessary in practice nowadays and what is necessary to be taught is a basic language that would allow architects to cooperate and negotiate their ideas with other expertise.

Session 2 entitled 'The Teaching of Construction and the New Materials and Techniques' posed the following questions:

- *What should be the necessary competences and skills acquired through construction education that*

allow architecture graduates to be capable of following the rapid development of the building industry in producing new materials and new construction methods respectively?

- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of following the rapid development of the building industry in producing new materials and new construction methods respectively?*

The two broader questions were condensed in a basic one: does the materiality of new architecture imply the need to use new materials? Two issues relating to the question dominated the debates of the workshop in order to shed light on this question. One was associated with the relationship between form and material and the other on the definition of materials and the emerging need to define a common vocabulary and terminology.

The first issue gave no definitive answer to the question. What was stressed however was that certain architectural forms allude to certain materials – a Corinthian column relates directly to marble- which brings us to the deduction that unknown architectural forms may not be related to the already established palette of materials but urge to further search. Moreover, we have to appreciate that the already known materials were produced to provide stable and unchangeable forms. The emerging question was whether or not these known materials would be capable of materializing mutable and changeable forms. The next question was what comes first: the invention of new materials allowing for new forms to be materialized or new forms promoting research in new materials that can materialize them. The participants of the workshop debated on the questions but did not reach any definite conclusions.

At the workshop, the discussion on definitions split construction teachers into two: those who understand new materials as the so-called smart materials and those who refer to plastics, composites, resins, fibers that have been around for quite sometime but have not been as extensively used as the classics (masonry, reinforced concrete, metal, glass, timber etc.). A new view was added to the relativity of the word 'new'. This view sustained that a traditional material could be considered new if it employs unconventional construction techniques that take it beyond its natural properties. This view supported the discussion on the smartness of certain traditional materials in a given context even though widely acknowledged as

mundane (Prof. van Hinte). Nevertheless it cannot be denied that despite the validity of such classification, it was stressed that there is undoubtedly research that yields to brand new materials that are generated from computer programmes in which the designer inserts data -the requirements and specifications of a material- and the material produced is new and unique. Alternatively the same method is used to modify the genetic code of known materials by giving them new properties. All this indeed is at an experimental stage. Nevertheless small scale applications will certainly allow more generalisable applications in the future given the time necessary.

Returning to the discussion of teaching construction in the design studio as in the first (2002) and second workshop (2003) of construction teachers, it was pointed out that in teaching materials in context, one can design any of the above typologies of material he/she wishes to explore and employ. This view gives rise to the invaluable abstract notions associated with materials. A fear was expressed that by talking about materials in isolation as if the only thing we have at hand is a palette from which we choose, designers run the risk of disengaging themselves from the poetic, sensual, tactile qualities and the like that materials are associated with. The need to define the architectural content of materials was also stressed.

In practical and operational terms it was argued that there is neither time in a school curriculum nor sufficient knowledge that construction teachers have in order to teach new materials, therefore, one could use the teaching of basics on materials as a prelude and teach the students how to find information on new materials. The discussion was again linked with that of the previous session, that is whether we teach basics through rules or whether we teach inquisitive minds beyond rules and limits. The first view was supported by the observation construction teachers made on the inability of a number of students to recognise materials when they see them, which proves that there is a lot to be done in relation to familiarizing students with the so-called known materials before exploring the unknown if time was ever dedicated to them and knowledge was possible to acquire. The fact that construction educators do not feel that sufficient time is dedicated to materials in a school curriculum may indicate that there is an attitude towards what is considered necessary knowledge for a school graduate and material knowledge seems to be low on the priority list. The solution proposed at the workshop to eradicate the problem is to teach materials in the design studio. The encapsulation of the

anticipation of materials in design teaching can only attribute to materials the meaning and 'smartness' they deserve.

Session 3 entitled 'The Teaching of Construction and the Environment' posed the following questions:

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be responsive to the sensitivities and consciousness of our society towards the environment, sustainability and energy conscious design?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be responsive to the sensitivities and consciousness of our society towards the environment, sustainability and energy conscious design?*

Participants pointed out that teaching environmental issues as part of construction teaching is most of the time useless to students as it can raise issues unrelated to the context in which they would eventually operate. Climatic and other environmental particularities ought to play a crucial role in student conscience. It was suggested that a way to achieve that is to teach regulations on the environment implemented in a country, thus putting environmental issues in context. This was opposed by two arguments. The one sustains that regulations may put the environment in a geographical context but they certainly do not integrate it in a design context and anyhow regulations are for the practice of architecture not for the education of students in the discipline. The view that sustainability should be taught in the design studio has many supporters who stress that what is important when teaching sustainability is to cultivate an attitude towards the environment in a broader design context. More specifically, it was proposed that one of the objectives in a student design project should be the sustainability of their proposal. In fact, the project should be assessed on the controlled energy consumption and passive energy systems it employs as well as its low maintenance cost and energy saving. Moreover, it was proposed that in the teaching of materials we can add to their inherent properties their sustainable qualities. The encapsulation of sustainability in the design project was also supported by the following argument: since the creation of form is central when design is taught it has to be stressed to

students that there are appropriate and adequate forms that ensure the sustainability of an architectural proposition better than others. One should not fall into the trap, set up consciously or unconsciously by the building industry, of 'dressing' an unsustainable building in terms of its form with sustainable 'clothes' as Prof. Hickey pointed out.

The next issue that dominated the debates in terms of sustainability but in relation to the previous session on new materials was recycling. It was suggested that introducing students to new materials or existing ones is not enough. In fact for a more sustainable built environment the issue of recycling of materials should be central. However, an unresolved concern remains the conflict between recycling and regulations, and as unresolved it is more of a problem in education. How can we teach an important issue when its validity is still unclear? The persistence at the European level to certify the environmental behaviour of buildings through regulations and specifications clashes with the idea of recycling old materials already worn out and impossible to officially certify from existing buildings.

Session 4 entitled 'The Teaching of Construction and the Rare and Traditional Knowledge' posed the following questions:

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be capable of encouraging the creative encapsulation and synthesis of particular knowledge deriving from the construction culture of a place to new construction logics and practices?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of encouraging the creative encapsulation and synthesis of particular knowledge deriving from the construction culture of a place to new construction logics and practices?*

Although the importance of conveying to students rare and traditional knowledge was stressed it was admitted that its teaching can be unattractive –as students are mostly fascinated by the new and unknown- and this has to change. Participants coming from countries with a strong historic background and a protective/ respectful attitude towards historic buildings pointed out that a school has the obligation to cultivate the necessary

ethos in its students to appreciate the old not only in terms of handsome forms in context but also in terms of its structural and environmentally conscious virtues. The question of sustainability, intelligent use, awareness and appreciation of materials in contemporary architecture can borrow wisdom from the old where technological limitations turned to the architect's advantage. Special courses dedicated to the teaching of rare craftsmanship and 'endangered' techniques should be ensured as a way of preserving them. Moreover, it was suggested that achieving all the above can be constructive if a well-organised databank is built up, circulated and enriched to all schools of architecture.

Last but not least it was pointed out that rare and traditional knowledge will remain neglected if in the minds of students we set artificial barriers between the old and the new and we do not see the continuum that has allowed our society to move forward either by the virtues characterized or the mistakes made in earlier times.

The general conclusions acted mostly as preconditions for the above mentioned discussion to be feasible. More specifically a necessary clarification was made with regard to the new nature of design studio teaching and this clarification has to do with the fact that information technology has intruded and dominated this milieu. This has to be taken into account when we talk nowadays of the design studio. This new nature of design and its teaching not only does not threaten the convergence between design and construction teaching – a schism which has shadowed architectural education for far too long- but, in fact, it encourages it.

A fresh idea put forward was that of performance-based design as a product of experimentation and invention. This was linked with the need for the creation not only of a database of building case studies but also of architectural practices.

The increased self-awareness each school ought to develop alongside facing the challenge of information technology towards shaping consciously the profile of their graduate will allow them to compete creatively and constructively in the rapidly developing world of architectural education.

Two keywords dominated the concluding sessions and these were inclusiveness and polarization. Inclusiveness seems to be necessary in teaching design and construction simultaneously and coherently. This can prevent the artificial polarization that has been created in schools of architecture.

In the search for the root of many problems in construction education, nowadays, the question of staffing a school of architecture seemed pertinent. Due to pressure to generate research schools employ researchers with no construction experience, a policy that might prove to be problematic in the pedagogy of the subject matter.

Another issue regarded ways that have to be identified to manage the infinite information that has been gathered. As it seems we could do with the information we have at hand with no need to invent new information as long as we can manage the existing one effectively and creatively. Finally, the bitterness of construction teachers of being unmapped in a school or rather not as appreciated as design teachers was proposed to be overcome by the establishment of a refereed journal which would allow them to publish good quality research output (Prof. Williams).

Last but not least it was suggested that discussions on the future of construction pedagogy are invalid if students are not part of this discussion, as they themselves are our future.

Sixty two construction teachers from 19 different European countries participated in the event this year. The expected outcome of the workshop was to attempt a mapping –not necessarily a synthesis– of the visions for the future of construction education. Furthermore, it was expected that certain levels of consensus could be achieved in relation to some commonly agreed landmarks recognised within the subject-specific area of construction. In any case, it was the mission of a construction teachers' network to identify and record these landmarks. This way construction teaching in each school can select and combine the landmarks in different ways, by taking complementary or alternative options by following different paths. Last but not least the network was able to encourage diversity, while respecting the freedom and autonomy of schools.