

The two parallel and complementary topics proposed for the third workshop of the Construction Teachers' Sub-network are perfectly chosen from point of view of teachers of my and other Polish architectural schools. Constant changes of political, economical, social matters causing also great modifications in building industry and investment process were our experience during last two decades. They were connected with the degradation of communism system in 80's, with transformation to capitalism after 1989 and now with joining the European Union.

The first topic concerns the expected profile of young architects after graduation which will allow them to confront the world of architectural practice in a changing society where common demands tend to be on constant reformulation. The competence and skills or essential requirements provided through construction teaching should lead to effective work in the real and changing world.

The second topic concerns the educational methods which will ensure the acquisition of these competences and skills – teaching methodology as well as structure of courses in which the competences and skills of a graduate can be ensured

The problems connected with these topics were somehow actual in the changes we already experienced. The changes in didactic programme and teaching methods reflected changes in actual organisation of investing and building processes

The main difference in the architectural practices between the past and present in Poland occurs in the organization of designing work and legal responsibility. In the old system the architect worked in the large scale state owned designing offices where he was a part of the team of several specialists groups – structure engineers, M&E engineers, quantity surveyors etc. He was responsible mostly for a development of an architectural form and functional layouts.

Somebody else, from higher management group, represented the office to the investor (in most cases also the state owned company) and decided about formal and financial matters. In such situation the young architect could have steadily and safely developed the skill under supervision of experienced designer. Also the limited number of building materials and technologies and the clearly defined standards made the designing simpler. In such situation the teaching of Construction could have been limited to basic information and general training knowing that further and deeper education can be achieved safely during the practice in the office.

The transformation to the capitalist system allowed the creation of private architectural practices of different size, from one man business to bigger ones organized accordingly to scale of the project. That changed the liability of an architect within the whole designing process. In most cases an architect

signs the main contract with the investor and then chooses independent consultants (structures, services etc.) who work for him as the subcontractors. Thus an architect is responsible for all legal and financial matters. Previously all of these had been included in the large state-owned offices organization.

Now the building materials and technologies, existing worldwide, are easily accessible. They are offered with aggressive, commercial advertisements. Because of that an architect must have ability of rational choice based on necessary knowledge and experience. In view of this the student must be adequately prepared for such duties especially in case when young architects start their private practices soon after graduation.

At the second workshop we learned about various methods of teaching of these problems, but the scope of basic theoretical knowledge possible to teach in usually limited time and it's relation to present and future technological reality is still a difficult and open matter.

Specialized firms connected with production of building materials, assembling components into technological elements, erecting prefabricated buildings are presenting to clients and architects information in technically elaborate way using computer programs, calculations, visualizations with possibility of variations of architectural form and adaptation to local climate. These particulars are prepared in such way that they may be used by clients without architect's help. This may weaken the position of an architect in designing and construction process unless local building law prevents it.

Students willingly observe achievements of contemporary architecture in nature or in professional magazines and books. In their designs they repeat, sometimes consciously and in many cases unconsciously, forms of existing buildings. Mainly they are interested in external view of famous buildings and imitate their fashionable elements. Lately popular among students were deconstructive forms, large glazing areas and double skin glazing – in cases of glazed surfaces usually without thinking about the climatic consequences of such decisions. Analysis of functional layouts of existing buildings and their relations to form are very rare. The knowledge of structural elements and construction systems are even more limited unless they are visual parts of an architectural forms for example expressed long span beams or space trusses.

The influence of contemporary architecture is visible especially at students' design studio works. Architectural design studio is considered by students as the most important and leading subject. In such situation the attitude of design teachers towards the whole architectural education process is very important. Ours, as Construction teachers, achievements also depend on their attitude - whether they stress importance of technical aspects or not. If they do so, the students would not treat the technical subjects as something completely alien to "architecture" and they acquire the knowledge we try to pass to them.

The architectural designs prepared by students has a form of concept stage design where the main objectives are functional layouts, spatial arrangements and visual effect. This stage appears in all design processes in real practices. The difference is that the experienced designer while

The Teaching of Construction and Contemporary Architecture

preparing a concept design or even doing primary sketches thinks or subconsciously feels the constructional aspects of the building knowing that it will be eventually realized. For students it is not natural, intuitive process. They have to be made aware that all aspects of design are important, even though at the beginning formal aspects prevail.

The role of studio teachers is crucial and difficult. They should not limit students' imagination but on the other hand should show also rational aspects of architectural design (function, stability, local physical aspects, lighting, choosing real materials to achieve visual effect). These rational decisions have to be obviously adapted to the scope of concept design. Too detailed technical particulars at the primary stage may limit visual imagination, but on the other hand rationalization strengthens the quality of architectural concept.

Students are very skillful in using computer techniques for graphics and visualizations. Looking from point of view of building materials choice this has a positive aspect. At least they have to decide what colour should be used on elevations and 3D visualisations that should represent real materials. It is one step forward in comparison to black and white elevations and monochromatic models. Nevertheless some students designs are, as Fausto Novi from Genova stated, the "Photoshop Architecture".

Assumption, that students are aware of importance of technical aspects in architecture and want to know more about it, place the special obligations on Construction teachers. The basic information necessary for understanding of construction process should be supplemented (in appropriate proportions) with the examples of the newest technologies applied in existing buildings. Thus students would feel that they are close to contemporary architecture and that it is a starting point for changing the professional reality by them in future.

The Teaching of Construction and the New materials and Techniques

Fast developments of technological possibilities, a large variety of modified and totally new construction materials and techniques offered in the building market have also influenced teaching methods. Teaching in traditional academic, encyclopaedic way is not sufficient. The lectures and school handbooks no more can be the only source of information about materials and technologies. The time given in curriculum is usually too short to cover all actual information. Constant changes cause also that some information given at the beginning of study period are already out of date at the end of it. Nowadays the students commonly use internet where they can find all current technical information, libraries of details in CAD, etc. They have to be taught how to seek information also in technical literature and professional catalogues and how to reach producers and distributors of construction materials. Such skill would be very useful in their future work as a constant seeking for current information about technological possibilities is an everyday practice of real designing work. But on the other hand the large amount of information commercially presented by competing firms causes the necessity of the rational choice. To do it sufficiently students have to be specifically aware what is the task of their search and how to evaluate acquired information. During the Construction course they should gain an ability to comprehend the basic problems connected with developing an

architectural concept to the building design stage. Knowing these problems they should be able to use their technical knowledge and all information sources to prepare technical drawings and specifications necessary for construction of the designed building. They should understand the relation between an architectural form, materials and structural principles in order to use the knowledge of Construction as the means for expression to serve their imaginations.

Environmental view of architecture may be considered in two scales: global and local. Global view concern sustainability connected with the foreseen limits in the exploitation of exhaustible energy sources. The awareness of such problem grows from seventies and has impact on all life areas, also at building industry. One can observe many ways of solution to this problem. The simplest is connected with thicker thermal insulation in order to decrease production of energy, which in turn save the sources and abate pollution. The thermal insulation requirements are usually set in local building codes. It is comparatively easily comprehensible by students that external partitions' (walls, roofs) construction should fulfil "U" value requirements and thermal bridges have to be reduced to a minimum. They may implemented it to their designs with no special problems. But "regulations does not mean comfort". Designer has to take into account other elements like ventilation, natural light etc. Also from sustainability point of view the production and transportation of building materials, also those used for thermal insulation may have negative impact on environment. More advanced view on sustainability refer to several forms of low ecological impact buildings – using bio-climatic technologies and non-conventional sources of energy (solar, passive and active, wind, heat-pump) considering shape of building, its orientation. This matters in basic forms are taught in our school at Construction and Building Physics courses and supplemented at some optional seminars and design studios. The progress in comprehension of wide matter of sustainability by students is visible but it has to be constantly intensified (also among adult architects).

In local scale all global problems are present but should be implemented individually. Architectural forms, technologies and materials should not be imported mechanically. Climatic particulars, construction traditions, existing neighbourhood, life habits have to be taken into consideration. Long time experience and common sense of our ancestors are worth to be followed.

Traditional constructing methods are presented to the students in the process of teaching of the various subjects - history of architecture, construction, structures with adequate attitude to the matter. This refers to use of traditional materials such as wood, stone, ceramics, their individual characteristics and methods of application.

Historical view connect the use of certain materials with the architectural form and style. Course of structures presents the mechanical properties and structural possibilities of various elements of traditional constructions. Constructional attitude extend it into other properties important for building process. It helps to examine the nature of things – to understand the basic and invariable principles and on the other hand the causes and effects of

The Teaching of Construction and the Environment

The Teaching of Construction and the Rare and Traditional Knowledge



Digging for the earth below the humus layer



Loading earth to marked sacks



Documentation of the depth of layers



Sieving of earth to exclude too big pieces

technological progress. That in combination with views from other fields should cause students' awareness of historical evolution of technologies and understanding of their internal substance. This substance derives from long time experience of logical use of materials connected with their natural properties, local climate and functional needs. From that originated the architectural forms typical for certain geographic areas.

For example the traditional carpentry of timber framework, when no metal fixing were used is an excellent model for understanding of structural matters. Following the modifications connected with the technological progress one comes to used nowadays light timber frame work, to structural elements of laminated timber and other forms of modified wood like plywood, Kerto, Thermowood etc.

Similar occurrence one can find in other traditional materials (stone, ceramics, iron, and other metals). They can maintain their natural features and beauty and then due to technological progress they can be used in more efficient way and widen the architectural effects.

According to the curriculum of our school all students of the eighth semester take part in the design studio dedicated to modernization of existing historical buildings. For this task the knowledge of both, traditional and modern technologies known from Construction courses in previous years is necessary.

Matters presented above are included in compulsory part of curriculum. Apart from that the teachers have opportunity to offer optional lectures and seminars to widen the basic knowledge. They are connected with various subjects of which one example will be mentioned here. Dr hab. Teresa Kelm from Contemporary Architecture Dept. in co-operation with Construction Dept. offered lectures and seminars concerning non-conventional building technologies especially earthen architecture: adobe bricks, rammed earth, compressed earth blocks, straw-bale, wattle and daub etc. She maintains contacts with CraTERRE in Grenoble and centers in Germany, USA, and other countries.

Earthen construction are sensitive to moisture, which appear in various forms in our climate. The historical building though from different areas in Poland and other similar climatically places (Grenoble area etc.) show that earthen technologies have been used successfully if they were protected from water. For example close to Warsaw there is a palace from XVIII century with walls constructed in rammed earth.

Our school received from Belgium hand operated press for making compressed earth blocks. It was used by students at the workshops to produce blocks using earth from different sites (also from school courtyard) as the one of the values of this technology is a possibility of using real "local material" from somebody's own site in order to reduce transport costs. (Photos show consecutive stages of described workshop). As the continuation of this action the small experimental building for University was planned to be built but it was postponed due to legal and financial matters. Meanwhile in order to observe a climatic influence to earthen elements students built some small walls. Some of them were covered with metal roof, other uncovered. Two are shown on the pictures. The uncovered one is steadily dilapidating, while the covered one is still in good condition (photos shows the situation after three years from erecting time).



Preparing of mixture adjusting proportions of components (sand, clay)



Compressing blocks in hand operated press



The block taken out of the press



Blocks put aside for drying



Not protected wall after three years of exposure to external weather conditions



Protected wall

Within the same cycle of optional workshop the students visited the factory where the straw and clay blocks are produced in rather traditional way. These blocks are mostly used as an infill of timber framework. Practically the whole production goes to Germany and France as in our country the ecological attitude is still very rare among the investors who prefer industrial products. The exercises of this type may increase students' comprehension of ecological attitude (microclimate, recycling etc.) but at the moment are still rather incidental.

Teaching in most of architectural schools is fragmented to separate subjects as the necessity from organizational point of view. But this does not conform to the situation existing in the real designing process. All aspects – formal, technical, environmental are considered here simultaneously from concept stage through whole design process to realization stage.

Even if there are separate subjects in school curriculum the task of architectural education is to educate the graduates in such way that they will be able to cope with all problems awaiting them in the professional life.

In previous parts of this text I have tried to show that interesting us problems are taught not only in Construction and other technical subjects but also are very often considered in design studio works. On the other hand teachers of technical subjects, especially if they are not architects, should remember that the main task of their teaching is preparing the graduate to work as an architect who will collaborate with structure and service engineers but will not do their jobs. In such situation the cooperation and exchange of experiences between several school departments, design studio including, is necessary. We have to build the **together** the identity of our architectural schools.

Dynamics and Tendencies