

Impact of the Construction subject on the quality of student projects in general building design in landscape architecture

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ABSTRACT: In this article, the author discusses how the Construction course module influences the building construction education of landscape architects at Cracow University of Technology (CUT) in Kraków, Poland. The aim of the Building Construction programme is to educate students, through various methods, about new building materials and technologies. One of these methods in practice is co-operation with the Construction course elements. The main overview of working together is provided in the first part of the article. The second part is an outline of the significance of this work in the quality of student projects in general building design within the third-year programme of BA landscape architecture studies. The third part is dedicated to analysis of the influence of seminars and lectures on the quality of these projects. One of the goals of teaching landscape architecture is to prepare students, future landscape architects, to make the right design decisions in terms of shaping the landscape architecture objects with the use of new building and construction ideas.

INTRODUCTION

These days, it is impossible to work in any field without the use of computers, new technologies and materials [1][2]. A landscape architect is representing a profession, which is suspended between fine arts and technical science. He/she creates his/her own masterpieces using modern building technologies, the newest materials and a CAD programme. This can help him/her explore new ways of expression and find unknown spatial forms both in the aesthetical and functional aspects of the created works. In order for him to act more and more creatively, new technologies and advancements are used in the educational process at universities all over the world [2].

METHODOLOGY OF WORK

For universities' teaching programmes to be up-to-date, constant adjustments and innovations are required. Education programmes of architectural studies have been subjected to analysis, change and criticism for years [3]. Especially nowadays, it is crucial to compare programmes implemented at different universities focusing on the objectives of the studies, methods and outcomes of teaching. For example, universities introduced the investment process into their programmes to help students in their future architectural practice [1][2][4][5].

At Cracow University of Technology (CUT) many adjustments have been made. Among them, the author created the teaching programme for the building Construction course for landscape architecture studies in the Faculty of Architecture. Since 2001, the author has conducted many lectures, seminars and design classes on this subject.

The author has presented details of the programme and its implementation. The first presentation titled, *Common Building (Building Construction) as a part of teaching Landscape Architects* took place at the conference, *EAAE Prize Competition 2001-2002, Writings in Architectural Education* in Copenhagen in 2003 [6][7]. Another paper entitled, *Modern technologies and innovations - landscape architecture education at CUT Kraków* was presented in Bratislava at the *4th World Conference on Technology and Engineering Education - Innovative Design and Education*, Slovak University of Technology, in 2015 [2]. This introduced the principles of teaching this course in the context of other courses, including Integrated Design (see Figure1).

The next article, *Building Construction education for landscape architects at the Cracow University of Technology - virtual and physical modelling workshops* [3] discussed physical and virtual models as a part of the teaching programme [8] for the Building Construction course carried out in semester 5 (winter semester of the third year) of landscape architecture studies at the Faculty of Architecture at Cracow University of Technology (FA-CUT). It was presented at the *8th WIETE Annual Conference on Engineering and Technology Education* in Bangkok in 2017.

In this article, an exploration is carried out of the landscape architects' curriculum that was presented at the 9th WIETE Annual Conference on Engineering and Technology Education in Bangkok in 2018; also introduced are the principles of teaching Building Construction in the context of construction courses.

CONSTRUCTION COURSE

The Construction course is part of the curriculum for the second- and third-year programme of BA landscape architecture studies [9]. The aim of the course is to familiarise students with the impact on structural elements using static diagrams and the calculation and dimensioning of curved, compressed and tensile elements. The aim also is to acquaint students with the strength and quality requirements of basic construction materials, glass and composite materials. The most important goal is to teach students the principles governing the selection of the dimensions of structural elements as a function of the static diagram and strength of the material.

After the course, students should be able to determine the load of a simple load-bearing structure. They should be able to select the most appropriate material and cross-section. Students acquire the ability to select the right construction material and the proper dimensions of the cross-section as part of the conceptual design of a roofing or supporting structure. The basic requirements for construction materials included in Eurocodes 1 to 7 (Eurocodes are European standards) should allow them to define material and structural requirements. The most important skill that the students gain is the ability to select appropriate structural elements [9].

BUILDING CONSTRUCTION AND CONSTRUCTION

The task of civil engineering (in this case Building Construction course, author's note) is to teach students the ways to materialise an architectural idea. In the Vitruvian triad, it is called firmitas. Architecture is a continuous fight for its materialisation - competition with gravity. Gravity as a basic natural law tries to draw together everything tangible to the Earth's surface. Material answers the thoughts of an architect about the environment created for human life. The fight with gravity is solved by nature in the most elegant way - the growth of most organisms takes place in a line directed to the centre of the Earth. Buildings, in fact, copy this process. Structuring (in this case Construction course, author's note) should offer the student of architecture information about the beauty of construction, how the construction lives and how it resists the pressure of gravity. In the end, a student must have a rational answer to all the why questions [4].

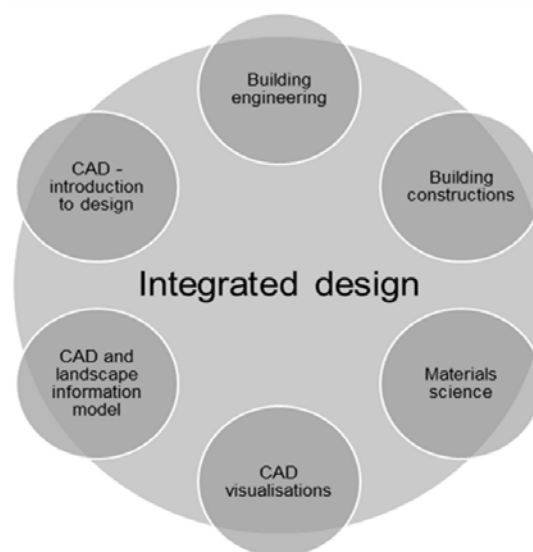


Figure 1: Relation between subjects at CUT in Kraków, Poland (by S. Kuc) [2].

In the process of teaching landscape architects at CUT, an innovative curriculum is used. The new approach consists of the introduction to technical subjects and integrating them in the Integrated Design course syllabus. This supports enriching the quality and the complexity of design projects. Student projects often include the newest design ideas and technologies, which are introduced during various lectures, seminars and workshops at CUT.

The programme of Building Construction aims to teach the newest but also about older building materials. The course involves the creation of a landscape architecture structure [8]. These concepts were previously developed as part of the Integrated Design and the Land Development project [3].

The idea to integrate design and technology courses arose during the creation of the teaching programme for the Landscape Architecture major. Its implementation as part of Integrated Design, Building Construction and Construction courses allows for the incorporation of real design into the student training programme [2][10-13]. The design process

consists of the following stages: pre-design, architectural concept, building construction design, construction design and detailed design. The concept of the architecture form is developed in the Integrated Design classes. The construction and detailed design are created in the Building Construction course conducted in close co-operation with the Construction classes (Figure 2).

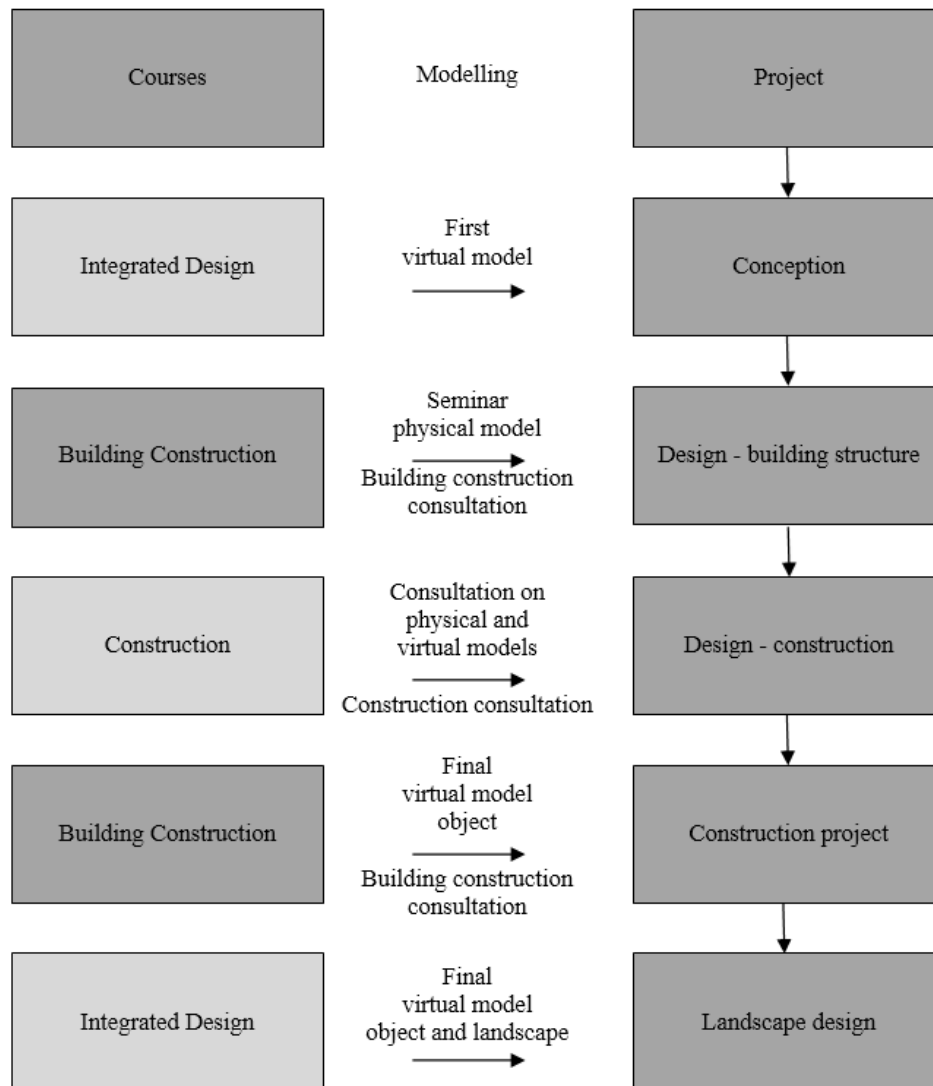


Figure 2: The third-year programme of BA landscape architecture studies at FA-CUT, which integrates design and technology (by S. Kuc) [3].

Construction in the Building Construction third-year programme of BA landscape architecture studies is most important. Creating the design is supported by a series of lectures in the field of Building Construction (Prof. Sabina Kuc - architect) and Construction (Dr Stanislaw Karczmarczyk - constructor). Various teaching methods are used [13]. Students develop an architectural and construction project under the supervision of two specialists (Construction and Building Construction), see Figure 2.

After the lectures and seminars in Building Construction, student concepts for architectural designs along with the first virtual models are developed in the Integrated Design classes. This is the second part of the Building Construction programme. This part of the programme consists of a series of eight sessions, the first being a seminar called Physical Modelling Workshops - Construction of a Landscape Architecture Structure. Students create a physical model of the final building with the use of selected materials ranging from natural ones, such as wood or stone, to more advanced ones like steel and new technologies (Figure 2). While developing the construction, including structural elements and connectors, students need to consult with the constructor. All the comments and alterations are very valuable. The consultations prepare students for the next stage of the project and to introduce them to their future architectural profession, which is also commonly based on a mentor-student relationship.

The subsequent seminar sessions are devoted to the creation of a building design. Students work on all elements including the projections, sections and elevations of the structure. Once the construction materials are identified, students develop the next version of the virtual model, i.e. the final virtual model, which presents architectural, structural and material solutions. Later, students supplement the virtual model of the structure with the surrounding elements, i.e. trees, shrubs, paths and benches, in Integrated Design classes. In each stage of the Building Construction

programme students gain an insight into the process of design, while the programme itself constitutes a significant contribution to the education of new landscape architects [3].

QUALITY OF STUDENTS' PROJECTS

Quality, as Plato opined, is *...a certain degree of perfection*. The quality of student projects concerns the quality of the design project itself - the intangible work, as well as the structure and material. The former involves compliance with regulations, standards and ethics of the architectural profession. At the same time, it also relates to the aesthetics and functional perfection of the designed structures; their practicality, reliability, durability, security and exclusivity (Figure 3).

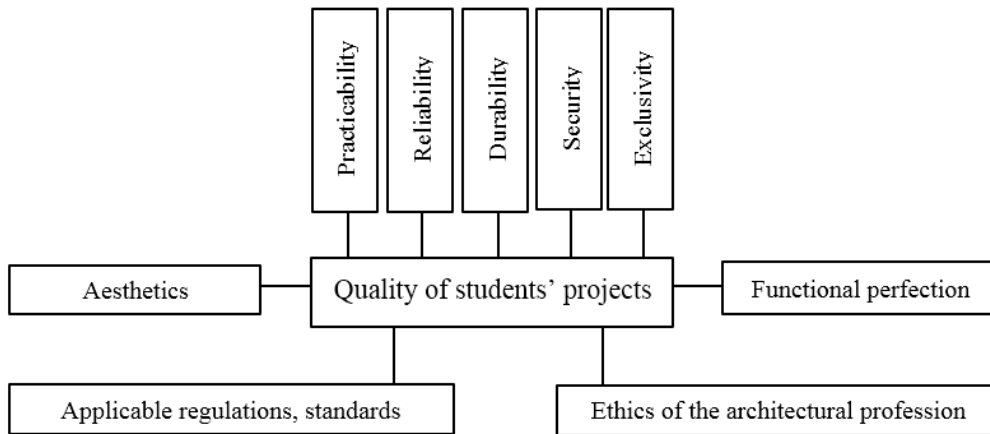


Figure 3: Quality of students' projects, landscape architecture studies at FA-CUT (by S. Kuc).

The close co-operation between both courses (Construction and Building Construction) in developing architectural and construction design projects increases their technical quality. The lectures prepare students to take on the role of *designer* by acquainting them with the applicable regulations, standards and materials required by building construction solutions. Construction consultations allow for the implementation of previously learned arcana of constructional knowledge in design.

Knowing the criteria for the preliminary selection of the cross-section of the basic elements of a load-bearing system allows the student to properly design the construction elements in co-operation with the designer. Knowledge about the basic requirements for construction materials acquired by students helps them solve material and construction problems in the design project.

The teaching of Construction and Building Construction should facilitate the integration of knowledge, ethics, applicable regulation and standards.

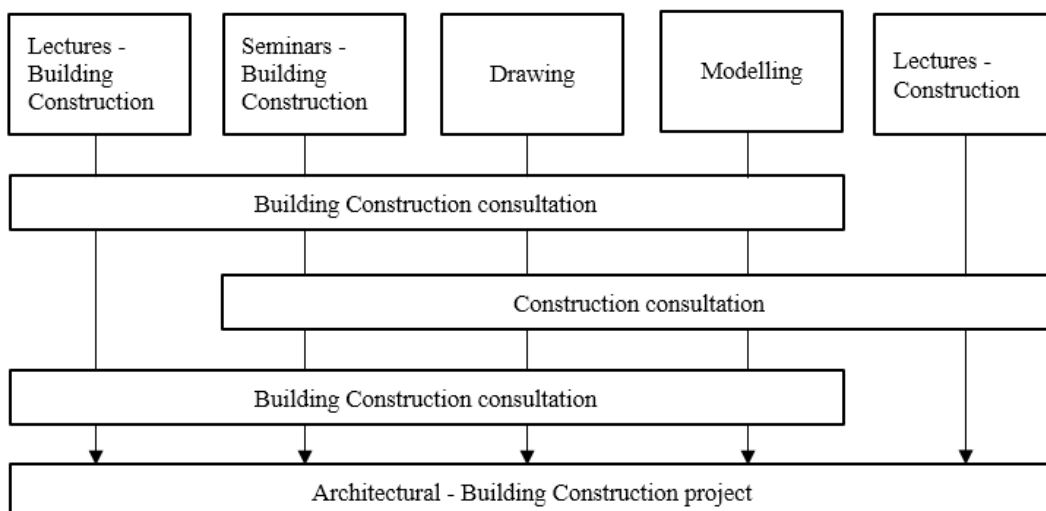


Figure 4: Construction and Building Construction work on an architectural construction project - landscape architecture studies at FA-CUT (by S. Kuc).

Building Construction and Construction courses teach students how to introduce the knowledge they gain during lectures, while designing a landscape architecture structure, i.e. creating an architectural and construction design

project. Drawing and modelling are important tools. They facilitate improving the quality of the landscape architecture structure. Both modelling-based and ...*drawing-based exercises provide a means of qualitative learning by relating more closely to architecture students' tendency to visually understand and express ideas, while hands-on exercises support applied learning* [5]. Consultation in Construction and simple construction calculations allow the determination of approximate dimensions of construction elements and to refine construction solutions.

These activities and tools affect the architectural expression of the structures and increase the quality of student architectural and construction design projects, approximating them to the design projects developed in professional architectural studios.

CONCLUSIONS

The aim of this article is to continue the presentation of a novel approach to the study of landscape architecture at Cracow University of Technology by providing an insight into the curriculum. The new teaching strategy used at CUT consists of the introduction of technical subjects into the curriculum and the adoption of an integrated approach to teaching. The multiple technical subjects are incorporated in an interdisciplinary Integrated Design course (Figure 1) [2].

Co-operation within the courses Integrated Design, Building Construction and Construction is the most important feature of the curriculum for the building subject in the field of Landscape Architecture at the FA-CUT.

This article is an illustration of how structural design can be taught in a way that relates more closely to architectural design studio work rather than to the conventional emphasis on calculation and dimensioning [5]. One of the goals of teaching landscape architecture is to prepare students, future landscape architects, to independently make the right design decisions in terms of shaping landscape architecture objects with the use of new building and construction ideas.

An essential element of the whole programme is the series of lectures, seminars and consultations during which students draw a structure and construct physical models of the construction as a part of or the whole landscape architecture structure. These drawings and models make the preliminary virtual model more detailed. They help create a structural construction vision and become a guideline for the implementation of a final virtual model. This enriches the quality of the projects. Thus, students develop their creative thinking and design processes [4][5]. This programme provides them with skills and knowledge about roof and constructions that they can further develop in their future work.

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