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ArchéA
Architectural
European Medium-sized City
Arrangement

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IO3
2021

Manual of best practices for a blended flexible training activity in architecture for higher education institutions

UNIVERSITÀ DI PARMA
DIA Dipartimento di Ingegneria e Architettura
ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
Silesian University of Technology
RWTH AACHEN UNIVERSITY
Normandie Université

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Editorial secretariat
c/o Università di Parma
Campus Scienze e Tecnologie
Via G. P. Usberti, 181/a
43124 - Parma (Italia)

Email: redazione@famagazine.it
Email: ArchéA@unibo.it
www.famagazine.it
site.unibo.it/ArchéA/en

This volume returns the results of the Intellectual Output 03 of the research project “ArchéA. Architectural European Medium-sized City Arrangement”, with the aim of analyzing and restating the state of the art achieved in the field of flexible mixed training in architecture, strongly encouraged by the emergency period of the Covid-19 pandemic. The result is a collection of good practices carried out internally and externally to the ArchéA partner network, in the context of higher education institutions, made possible by new virtual tools capable of mediating teaching and mixed and flexible learning around the disciplines related to the project.

ArchéA. Architectural European Medium-sized City Arrangement

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edited by Enrico Prandi and Paolo Strina

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Analisys of the Best Practices

Call for papers

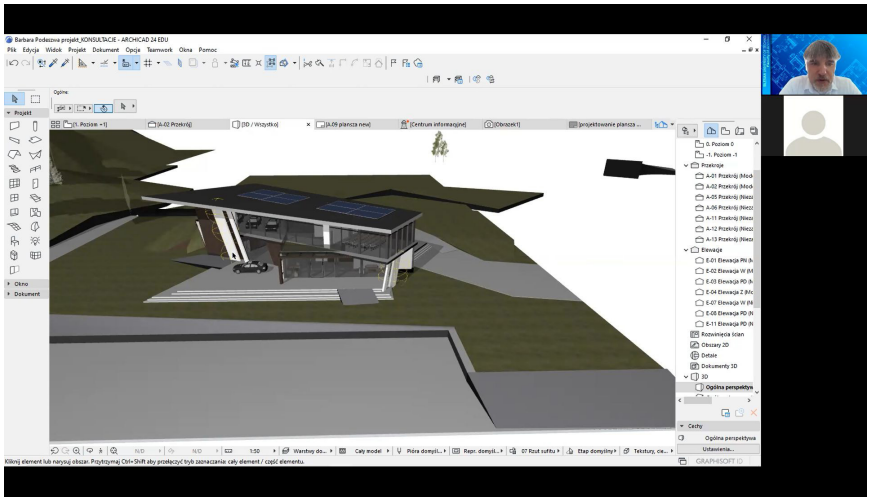

Fig.01 3D model presented by the student during the architectural design studio

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Dariusz Masły

Distance learning of designing high-performance, sustainable, intelligent buildings at the Faculty of Architecture of the Silesian University of Technology

Silesian University of Technology, Poland

The article presents experiences from the use of distance learning methods during project classes, seminars and lectures. The author conducts 3 courses in the field of sustainable architecture, high-performing buildings, energy efficiency and modern methods for simulating the building performance. These are: "New Technologies and Methods in Architecture Design", "Intelligent Building - Building Performance Analysis" and "Specialist design resulting from local conditions". Students taking the courses are in the first year of Master's studies at the Silesian University of Technology (SUT). Following the European Bologna model, this program at SUT lasts one and a half years and requires a bachelor's degree. The primary aim of these subjects is to develop the skills needed by the architecture student to be objectively critical in selecting high performance, sustainable, intelligent design solutions and to provide the knowledge needed to perform computerized analysis of building performance. To achieve this goal, students learn about definitions, terminology, a broad, general area of sustainable building quality, building performance analysis and evaluation methods. Most building assessment methods have reached their current level of advancement in the last four decades. The author proposed to classify quality evaluations into flexible methods focusing on user experiences with building performance (e.g. Post Occupancy Evaluation) or methods based on a systematic set of building performance categories. The second category of methods is presented during the courses. Among them are: Green Building Challenge (GBC), Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM), and The Real Estate Norm (REN). These methods enable scientists and practitioners to develop benchmarks and standards. At the beginning selected case studies of high-performing buildings are presented. Analysing them allows students to identify most promising energy-efficiency and occupants' comfort measures in different building types. During seminars students gain skills in evaluating these measures. Students' analysis teaches them to distinguish between buildings that are actually high performing and those that are not sustainable in practice. Then the lectures present the use of solar radiation for lighting and heating, control of heat gains and losses through the orientation and form of the building, comfort control without the use of fossil fuels. During design classes, students learn, in particular, the techniques of applying new and innovative simulation methods, techniques and tools for analysing the quality of daylight, energy efficiency of buildings and user comfort. Equipped with a thorough understanding of what a sustainable, high-performance, passive, and even zero-energy building means, the student is able to evaluate architectural solutions both at university and as a practicing professional. Finally, a simulation-based computer course takes place. Students learn Building Performance Analysis tools. Knowledge in the field of BPA allows students to develop their skills and ultimately perform their own computer simulations when designing in an architecture design studio.

At the beginning of the first semester, after the announcement of the lockdown in Poland in March 2020, distance learning took place mainly at the Silesian University of Technology using the e-learning platform. This tool had many limitations, e.g. the size of uploaded files could not exceed 10 MB. This made it practically impossible

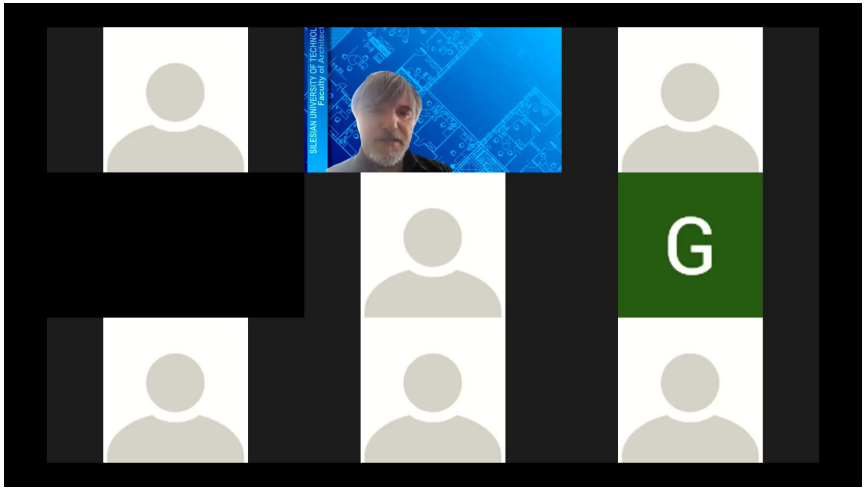

Fig.02 Discussion during the seminar, students' cameras are turned off

Fig.03 Case study presented by the student during the seminar

to provide students with video materials. Not to mention recording entire lectures and making them available to students. In the first period, teachers were looking for free software that would enable online conversations and team collaboration, e.g. skype, microsoft teams, and tried to use them during classes or consultations. These attempts were unsatisfactory. Sometimes there were dropped calls, delays, and poor-quality audio and video. With too many participants, conducting conversations became very difficult. At the end of March, the university purchased the Zoom.Us video conferencing tool. From that moment on, lecturing for up to 300 students ceased to be a problem. The video platform made it possible to present video materials with sound, show presentations in various formats and activities performed by the teacher and students on their computers. Thanks to this, it was possible to conduct computer software classes in real time. The Zoom.Us also made it possible to record lectures and classes in high quality. These learning materials were then made available most often on Google drives created by a given group of students. For example, 30 hours of recorded HD lectures fit easily on a standard size Google drive. Teaching materials in the form of large files were also made available on OneDrive, an online cloud storage included in Microsoft 365. Currently, materials in the form of large files are collected on Nextcloud. Links to learning materials are posted on the e-learning platform. To sum up, at the end of March 2020, the employees of the Silesian University of Technology were equipped with tools for conducting design studios, classes, seminars and lectures. It should be emphasized that from the very beginning of lockdown, training for teachers in the use of remote learning tools was conducted.

Architectural design studios are very troublesome when it comes to distance learning. Criticism/ Critique is one of the most common learning methods. During the classes, the student's graphic work is presented and the tutor reviews it. Teaching involves non-verbal forms of communication. Although the online presentation of students' projects in real time is possible, for example via the aforementioned Zoom.Us video platform, the legibility and comprehensibility for the teacher of the design solution presented on the screen is much lower than the documentation in the form of a printout. In the case of the latter, e.g. a floor plan or a cross-section is perceived as a whole, and the eye moves freely across the unfolded drawings, quickly focusing on a selected fragment, and then immediately jumps to the analysed solution on another drawing, enabling immediate comparison. The presentation of an architectural design on a computer screen allows the whole sheet to be shown on the screen, the design in this form being illegible, or a close-up of a selected fragment. The analysis process is no longer smooth. This problem also occurred during traditional classes, when the student did not bring a printed project, but presented it on a laptop. However, working using a video conferencing tool brought additional difficulties. Displaying parts of the project saved in separate files took longer, which disturbed the smoothness of the analysis. Moreover, even when the project was presented on the computer monitor during the traditional class, the graphic correction made by tutor was most often in the form of sketches on paper. Sketches in computer documents are also possible, which was used in distance learning, but the constant switching of the presentation possibilities between the teacher's and the student's computer additionally slowed down the process. At this point, the issue of presenting a 3D model on a computer should also be mentioned, which presents the architectural design more clearly than traditional 2D documents. The Zoom.Us platform allows you to remotely control the student's computer and view the project as desired. Although the author of the paper does not run an architectural design studio, he encountered these problems while conducting diploma consultations.

Conducting lectures via Zoom.Us video platform did not cause any difficulties. Admittedly, controlling student participation in the lecture was not possible. The view of students from their computer cameras was turned off, because with the lower internet bandwidth on the students' side, displaying the image from the camera disturbed the transmission of the lecture. Therefore, it was possible to have cases where a student connected to the lecture transmission but did not actually listen to the lecture. In smaller groups, such as seminars, the students' cameras were also turned off for the same reason. However, the presence of students could easily be checked by their participation in the discussions. The video conferencing tool made it possible to divide students to work in smaller groups and assign these groups to separate virtual rooms. The seminar leader moved freely between the rooms, checking the results of the group's work. At the end of the seminar, the results of the work were presented by the groups to all students.

The last type of classes conducted by the author of the paper is teaching the use of CAD and Building Performance simulation software. The students pointed out that it was difficult to watch the activities performed by the teacher on a single monitor and repeat them on the same monitor. Students could not keep up despite the fact that they had previously downloaded the course materials from the e-learning platform. If the windows of the computer program and the video conferencing tool were reduced in size and placed next to each other, the CAD software interface in both the displayed video transmission and the software installed on the student's own computer became unreadable, the command icons were too small or

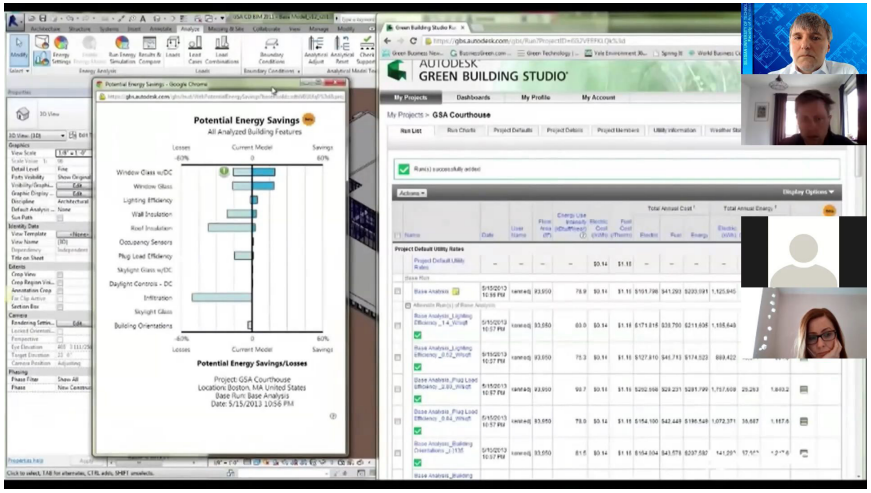

Fig.04 Video presented at a lecture on high performance buildings

some of them became hidden from sight. Of course, the best solution was to use two monitors, but few students had them. Students solved this problem by displaying the material presented by the teacher on a smartphone. The computer monitor displayed the interface of the program being used. The teacher could, of course, respond in real time to student questions and problems, adjusting the pace of the classes to the abilities of the group of students, and repeating selected fragments. It was practically impossible to control participation in classes and work progress.

In addition, all lectures, seminars, and classes have been recorded and uploaded to the cloud service. The students were very pleased with that, which they reported more than once. Traditionally conducted classes were not recorded.

Passing the lectures and seminars given by the article's author took place after submitting a presentation on a topic specified by the teacher. Final slide presentations were uploaded to the e-learning platform or sent directly by e-mail to the teacher's address. Computer software skills were tested using the video platform. The students presented a 3d model of a building they had made and performed the tasks specified by the teacher. This skill check was recorded.

In conclusion, the modern distance learning tools provided by the Silesian University of Technology for teachers allowed them to conduct lectures, seminars and classes without any difficulties. They have even created new possibilities, such as recording all lectures and classes and making the recordings available to students. It also became easier for the student to contact the teacher. The student could call the instructor and ask for an individual consultation via the video conferencing platform. During the phone call, an appointment was agreed upon, after which the teacher sent a link to the student's e-mail address. Some difficulties were caused by architecture design studios or, in the case of the author, by diploma consultations. These required more work and time devoted to review the student project.

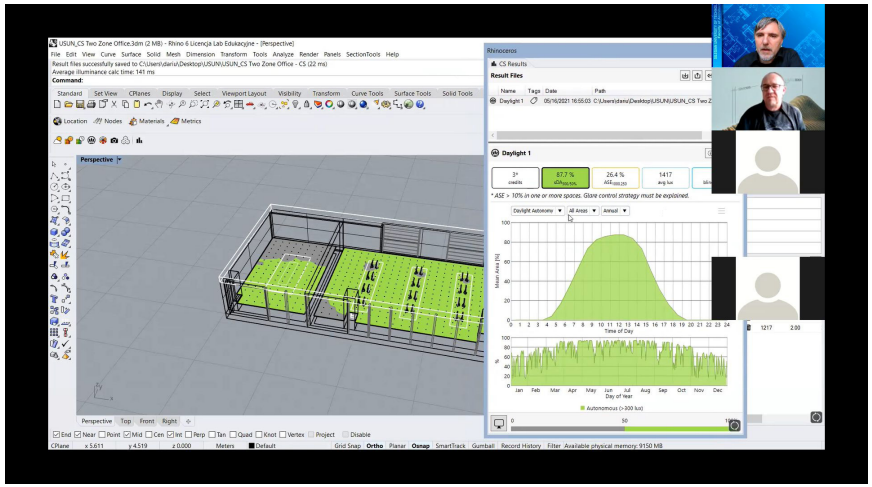

Fig.05 Teaching the use of CAD and Building Performance simulation software