FAM

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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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.

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edited by Enrico Prandi and Paolo Strina

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Analisys of the Best Practices

Guest professors

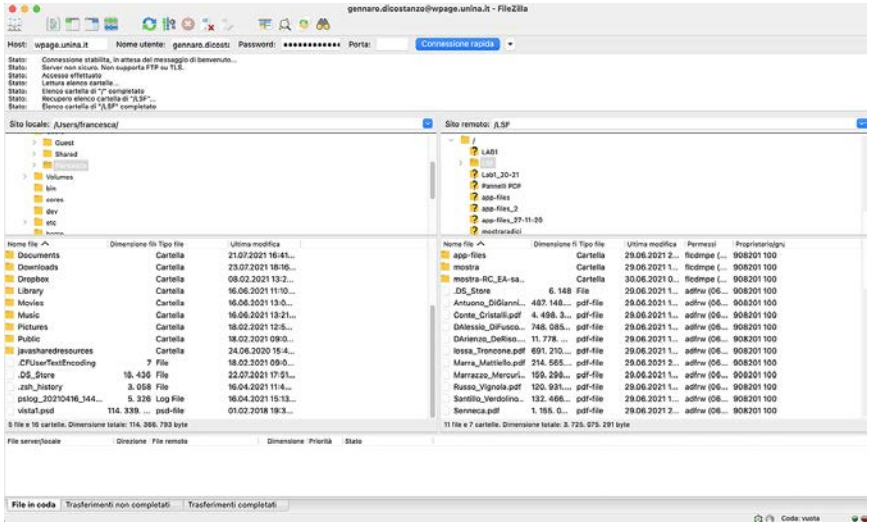

Fig.01 Virtual exhibition of the Architectural and Urban Studio 1, a.a. 2020-21, Prof. Arch. Renato Capozzi with architects Roberta Esposito, Nicola Campanile, Francesca Spacagna.
Fig.02 Interface of the Open Source software Filezilla.

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Renato Capozzi with Nicola Campanile, Gennaro Di Costanzo, Roberta Esposito, Oreste Lubrano, Claudia Sansò, Francesca Spacagna

Virtual exhibition for design workshops. Some experiences at DiARC_University of Naples "Federico II"

University of Naples Federico II, Italy

Introduction

In the following we describe some conceptual steps and problematic nodes concerning the theme of new and integrable ways of laboratory teaching aided by advanced computer tools developed at the Architectural and Urban Composition Studio or Final Architectural Studio of the five-year single-cycle degree courses in Architecture and the Master's degree course in Architectural Studio at the DiARC of the University of Naples "Federico II" held – - in the academic years 2019-20 and 2020-21 – and coordinated by Renato Capozzi with the collaboration of Nicola Campanile, Gennaro Di Costanzo, Roberta Esposito, Oreste Lubrano, Claudia Sansò and Francesca Spacagna. The contribution, starting from a questioning of the potentialities but also of the limits of a didactics of the project according to the D.a.D. or blended modality according to a wider perspective of heterotopic sense of Foucauldian matrix in the paragraph "Real VS Virtual", is articulated in three more technical related paragraphs: "The 3D models"; "Elaboration of the sharing interface"; "Experiences of virtual exhibitions". The essay ends with some provisional "Conclusions" that reflect on the actual potentialities and development prospects of the combined use of the technologies employed. While the text "3D Models" analyses the main techniques for the production of virtual models to define the spheroidal environment in which the exhibition is to be located and the fundamental elements (graphics and models) for the construction of the exhibition's itinerary or multiple itineraries, the following section describes the phases of elaboration of the multimedia product to be shared on the web or through other media, offering the user autonomous navigation in the exhibition spaces and a strong interactivity of its contents. At the end, the main experiences of virtual exhibitions produced in 2020 and 2021 are reported and exhibited for the first time on 28th November 2020 (only for a part related to the *annus terribilis* 2020) in the Researcher's European night, promoted by MEET me TONIGHT "Faccia a Faccia con la ricerca", Link city | DiARC UNINA *neaPòlis* Scuola Politecnica e delle scienze di base – Università degli Studi di Napoli "Federico II" through the system: Jitsi Meetings.

Real VS Virtual

The current pandemic condition, caused by Covid-19, has triggered reflections on both real and virtual space. It's possible to say that the division of human activity has split into two categories of space, the interior and the exterior, altering the previous balance that held them together.
In addition to the canonical *indoor* activities, the interior spaces of the dwellings have also accommodated all those actions that used to be carried out in the city's exterior spaces, thus emptying the outside of all human action. Even work spaces are being rethought and redesigned with a tendency towards the lack of the physical place, and in this respect great challenges arise which, if overcome, can overcome the risk of isolation and a-sociality (other than social distancing), generating a possible denial of the real relationship with the community that finds its moment of encounter, in this tragic condition, only in virtual space. In this sense, the ways of transmitting knowledge and, therefore, of teaching have inevitably changed, leading to the adoption of web platforms capable of not interrupting both communication between people, transforming it from physical and haptic to intangible, and teaching through D.a.D. or

blended teaching. The "real" collective space for communicating and sharing ideas is extended, thus becoming a "virtual" space and encompassing, in this way, a larger pool of users but greatly reducing interactions between teachers and students and among students themselves.
The new technologies are making more and more tools and services available for getting to know each other, exchanging ideas, reducing distances and establishing contacts with different cultures and worlds more and more quickly. This means that the place of dialogue, previously a "real" space, takes on a new form, becoming a "virtual" space and, at the same time, a necessary interface for sharing knowledge. These are tools capable of extending the possibility of dialogue to a vast and potentially infinite public, which becomes an active part of a collective and shared discussion. With the help of this advanced software, it seems possible to achieve a real sharing of intentions and competences that allow individuals in a community, but not only, to carry out collective actions and debates in another, immaterial place: the "virtual".
Virtual reality, however, in addition to appropriating human experiences and relationships, also tends to transform the places where human community action takes place, making them volatile and unattainable. From the moment that all activities can take place virtually in real spaces, these adapt by becoming incubators of experiences and configuring new spaces corresponding to definitive and pervasive extensions to the domestic of the global network. Real space becomes promiscuous: place of work, place of schooling, place of apparent encounters. As understood by Michel Foucault, real space becomes "heterotopic"[1] corresponding to a real place that is actually realised but which is configured as a place outside of any place.

3D Models

The project of a virtual exhibition generally includes two phases: the first one concerns the elaboration of the digital model of the exhibition, including the environment that will host the exhibition, the exhibited objects – being specifically a transposition of a university exam in Architectural Composition, it is a matter of exhibiting the virtual correspondents of graphic and plastic works – and the possible illuminating objects that guarantee to the virtual environment a correct lighting for the elaboration of the render images. The objective of the modelling phase, in fact, is to obtain 360° digital images, for example a representation of the 3D environment that frames in a single view all the possible angles that a hypothetical viewer would obtain by rotating on himself. Such digital elaborations are called "spherical renders" or "spheroids" because of the characteristic "photography" of the environment impressed on an ellipsoid, a three-dimensional surface that can be obtained by rotating an ellipse around one of its axes. The "explained" ellipsoids, similar to the types of representation of the globe that can be observed on maps, are functional to the subsequent construction of the "route" of the virtual exhibition. The second phase, in fact, consists in the use of software for acquiring and processing multimedia files with which to concatenate the spherical renderings into a visual sequence representing the virtual tour of the exhibition.
In the first phase the modelling and rendering software ArchiCAD by Graphisoft was used. Once the modelling of the environment had been completed, the environment was integrated with the students' work, which, as mentioned above, being two

Fig.03 Virtual exhibition of the Final Architectural Composition Studio, a.a. 2019-20, Prof. Arch. Renato Capozzi with architects Gennaro Di Costanzo, Gianmaria Santonicola, Sara Sgueglia, Francesco Vitiello.

Fig.04 Virtual exhibition of the Architectural and Urban Composition Studio 1, a.a. 2019-20, Prof. Arch. Renato Capozzi with architects Claudia Sansò, Nicola Campanile.

types of work, required two different procedures for insertion into the virtual environment. The graphic works and the models were converted, respectively, into .jpeg files and into *.gsm objects, in order to obtain file types compatible with the applications allowed by the modelling software.
For the insertion of .jpeg files, the software allows images of this format to be loaded into the surface catalogue in the library. The surface catalogue, generally intended for the setting of materials with which to represent the materiality of the various architectural parts of the model, also allows, by forcing the basic logic, the simulation of the application of objects superimposed on the surface of the architectural element, as happens in real life for the application of wallpaper, posters or, in this specific case, printed panels on wall surfaces. The image, set up as a texture, is then applied to a surface within the model, simulating the exposed panel.
For the insertion of the models, however, the procedure differs slightly while maintaining some procedural similarities. In this case, the function of the ArchiCAD software for translating a three-dimensional model into a *.gsm object file was used. The real model, as already mentioned, was "translated" from the real to the virtual through the construction of a three-dimensional model, elaborated in turn in the ArchiCAD software from which it was possible not only to obtain a simulation of the model, but also to extrapolate the 2D drawings that formed the basis for the graphic tables representing the student's compositional exercise. The three-dimensional model file, generally with the *.pln extension, can be exported, among others, as a *.gsm object file, and then re-imported, with much smaller dimensions to the detriment of modifiability, into another ArchiCAD file, in this case into the virtual environment hosting the exhibition. At the same way of what happens for the surfaces, such *.gsm files are then loaded in the library of the file containing the environment modelling and then inserted inside the model. The only possibility of post-editing that allows a *.gsm file, exported with basic settings, is the overwriting of its surfaces, which, for the case in question, was sufficient to homologate all the virtual "models" with the "white paint" surface.
Once the virtual environment had been set up, the process of constructing the exhibition involved the elaboration of the aforementioned spherical renderings, guaranteed by the same ArchiCAD software, which for some versions has now been implemented with the CineRender rendering engine. The CineRender engine includes, among other things, the so-called spherical camera, which is necessary and sufficient for the processing of spheroids. The spherical camera, set up in a rectangular equi-format in order to meet the requirements for the subsequent processing phase of the virtual tour, allows the processing of the spherical renders that can be acquired, after the production of the image, in .jpeg format and functional for the subsequent sorting and construction phase of the virtual tour, carried out in this specific case through the use of the open source software Marzipano Tool, with which the sequence of the spherical images was created, sorting them

Fig.05 Virtual exhibition of the Architectural and Urban Composition Studio 1, a.a. 2019-20, Prof. Arch. Renato Capozzi with architects Claudia Sansò, Nicola Campanile.

according to the path established for the exhibition.

Development of the sharing interface

At this point in the work, the spherical images are ready to be "connected" to each other by defining a real virtual path. For the publication and sharing of the spheroids and the subsequent conversion of the format from rectangular equi to *tiles* (small square images, literally "tiles") we used Marzipano Tool, software through which it was possible to order the images by prefiguring an ideal path. When adding the spherical sequences to the *tool*, it is possible to prefigure the information acquired in different folders, each referring to a specific panorama to be extended and personalised. This action is necessary in order to obtain a smoother display mode on the main browsers. Specifically, the open source software Marzipano Tool has an easy-to-manage interface in which it is possible to customise the various display parameters, as well as modify the panoramas to better orientate oneself within the virtual tour. The sharing interface adopted by the Marzipano Tool software is defined by means of a virtual tour which, as we have seen, is specially structured to receive content, specifically the students' teaching work. In order to insert this content in the virtual space, it is necessary to use a storage server on which the various files are uploaded. This operation is carried out using another Open Source software such as Filezilla, which allows files to be transferred on the Net via the FTP protocol using the storage space made available by a Host from which clients can download and view the files present. The Host, in the specific case of the virtual exhibitions already processed by the writer, is associated with an institutional address of the relevant department, making the operation totally free of charge. The various contents uploaded on the Host are then inserted in the virtual space of the exhibition through links that recall the path generated by Filezilla, the same Internet address that hosts the virtual exhibition is generated in the same way, that is, the installation file generated by Marzipano Tool is inserted in the Filezilla storage space, which thus has a network path that can be freely accessed.

In short, this operation generates an interactive and always accessible product through which it is possible to explore the projects on show, providing a virtual environment capable of receiving the collective and transmissible value of the Exhibitions. Virtual navigation makes it possible to find one's way around the museum space, offering a personalised itinerary that can be continually questioned by the user through the use of menus or connection arrows that facilitate the reading of the scenario. Navigating in the virtual environment, from different points of view, the heterogeneous disciplinary, multimedia and text contents are explored and selected, directly involving the visitor in the museum experience: thanks to the interactive links it is possible to access the numerous multimedia insights, made available to users for a fascinating journey in which the museum space, the layout and the works on display merge into a single communication channel.

Fig.06 Virtual exhibition of the Final Architectural Composition Studio, a.a. 2020-21, Prof. Arch. Renato Capozzi with architects Mario Criscitiello, Gennaro Di Costanzo, Oreste Lubrano.

Fig.07 Virtual exhibition of the Final Architectural Composition Studio, a.a. 2020-21, Prof. Arch. Renato Capozzi with architects Mario Criscitiello, Gennaro Di Costanzo, Oreste Lubrano

Experiences of virtual exhibitions

Experiences of virtual elaborations of exhibitions, collecting the results obtained at the end of the laboratory courses, were carried out within the Final Architectural Composition Studio and the Architectural and Urban Composition Studio 1, both for the academic years 2019-20 and 2020-21, at the DiARC_Department of Architecture of the University of Naples "Federico II", courses held by Professor Renato Capozzi. At the end of the work, the students developed, with the help of the authors, virtual exhibitions[2] in order to share their reflections with a wider audience and open a debate involving all the actors, direct and indirect, of the process. Specifically, the preparatory work for the exhibition saw the students involved in the creation of a virtual environment to support the design and analysis work of each individual student. The Final Architectural Composition Studio, for the academic year 2019-20, adopted the space of Ludwig Mies van der Rohe's *Neue Nationalgalerie* as the exhibition site, and for the academic year 2020-21 the virtual elaboration of Le Corbusier's *Tower of Shadows*, and finally for the Architectural and Urban Composition Studio 1, academic years 2019-20 and 2020-21, Ludwig Mies van der Rohe's *Museum for a Small Town*.

These paradigmatic works of modern architecture were chosen because, more than others, they

managed to express the condition of universality of space. The exhibition design was understood as a "project that shows other projects". In this sense, the experiences of the virtual exhibitions constituted a fundamental phase for the success of the courses, as it was possible to achieve a real sharing of intentions and competences that allowed the students, but not only them, to become aware of the unity of the course and of the need to carry out a collective work, instead of the unrelated condition from which we started in the first months of distance learning.

Conclusions

The virtual exhibition, once designed, as has been shown, can therefore be used as a digital support for the display of educational works, in a similar way to what happened previously, and can take on the function of an additional immaterial place, alongside the unavoidable one. in presentia, in which a fertile and necessary dialectical confrontation can take place between students, scholars and teachers. The final exhibition of the works constitutes, in our opinion, a consolidated practice and has assumed, in the present time, an unprecedented form becoming a virtual space but at the same time a necessary interface for the sharing of knowledge, a certain surrogate but also a tool that extends the possibility of the debate on the choices made to a wider, potentially infinite audience, which is placed in front of and can contribute to a shared collective work and its necessary "falsifiability".

Notes

[1] The term "heterotopia", coined by Michel Foucault, indicates «those spaces which have the particular characteristic of being connected to all other spaces, but in such a way as to suspend, neutralise or invert the set of relationships which they designate, reflect or mirror» (translated by authors).

[2] http://wpage.unina.it/gennaro.dicostanzo/LSF/RC_EA_mercatosangiovannididio/; https://mostralab1.wixsite.com/2021; https://lsfcapozziattaiane.wixsite.com/mostradidattica; https://nicolacampanile4.wixsite.com/lab1-mostraonline.

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Definitions

Augmented and virtual reality
Augmeneted reality technique has been explored either inside the museums or in the open-air in archeological sites. On-site virtual reconstructions can be presented outdoor in real environments to substitute physical rebuilding of historical remains, which could interfere with archeological research. (Cláudio A. P.,Carmo M. B. 2013)

Blended learning (Blended)*
Learning mode that combines different learning environments, typically face-to-face and remotely. It was born before the COVID19 pandemic but remains of limited use in non-telematic universities

Common model
Virtual project model elaborated simultaneously by the project actors according to a BIM logic. Each actor deals with a single part that converges to the whole. A series of layers overlap the work base, implementing the information. The latter can be interrogated in order to extrapolate analytical data of the objects constructed and represented.

Delivery Teaching *
According to the ANVUR 2017[1] guidelines, one of the two divisions of the teaching methods of a teaching delivered electronically in the form of video-lessons by the teacher in charge of the course (with the possibility of using video-lessons or open courses of other Universities).

Digital boards
Remote interface multimedia screen. The documents displayed on it can be shared and modified remotely by multiple actors and the information exchanged is synchronized in the shared document in rael time.

DVLE Distribuited Virtual Learning Environment [3]
Distributed virtual environment in which the tools available to faculty and students converge for teaching and distance learning.

3d and augmented reality model
Is an enhanced version of the real physical world that is achieved through the use of digital visual elements, sound, or other sensory stimuli delivered via technology. It is a growing trend among companies involved in mobile computing and business applications in particular. It's, also, a ggod practice to comunicate and show the architectural project.

E-learning platform
Online container for scientific learning of the disciplines. It contains educational materials on various media (videos, slide shows, tutorials, texts, etc.) with the possibility of performing learning tests in real time through dedicated quizzes.

ILO Intended Learning Outcomes [4]
Objectives of flexible and blended teaching and learning.

Integrated Digital Education*
Teaching method proposed in the second phase of the COVID19 pandemic to integrate the methods of the "Fully distance learning" with face-to-face and blended activities.

Fully distance learning*
Method adopted during the initial phase of the COVID19 pandemic, mainly synchronous.

Hybrid teaching methods
Hybrid learning combines face-to-face and online teaching into one cohesive experience. Approximately half of the class sessions are on-campus, while the other half have students working online.

High-hand interaction device
"Over the last few decades, human–device interactions have changed from text inputs to graphical user interfaces. Therefore, we need to see how we can serve the multifaceted human interface, for a new era of interactivity, where smart interfaces can "see," "hear," "feel," and "understand," transforming our experiences with the content of all form-factors to make them more engaging and immersive. These advances, coupled with remarkable innovations in sensing and display technologies, will transform today's way we see the smart systems and, for these, oxides at a nanoscale will play a core activity, especially for the growing concept of system-on-panel (SoP) to enable various functional devices, such as driver, sensor, memory, and controller devices, to be integrated into a single panel for achieving high-performance, low-cost, and more compact smart/intelligent products. Interaction device: is the device where the user can receive position, localization, navigation instructions, etc., and interact with the information. It can be a specific dedicated device, a computer, a tablet, or, more commonly, a smartphone. It is something that the user takes with himself or herself." (www.sciencedirect.com)

Immersive learning
Immersive learning is a learning method which students being immersed into a virtual dialogue, the feeling of presence is used as an evidence of getting immersed. The virtual dialogue can be created by two ways, the usage of virtual technics, and the narrative like reading a book. The motivations of using virtual reality (VR) for teaching contain: learning efficiency, time problems, physical inaccessibility, limits due to a dangerous situation and ethical problems.[2]

Intellectual output
Result of a thematic activity carried out at a distance, summarized in a product suitable for the transmission of the contents to be highlighted and shared by the "shared-comunity".

Interactive Teaching *
According to the ANVUR 2017 [1] guidelines, one of the two divisions of the teaching methods of teaching delivered electronically in the form of e-tivity and interactive and collaborative activities (e.g. interactive videoconferencing, homework, group work, formative assessments , etc.).

Learning Management System (LMS) *
According to the ANVUR 2017[1] guidelines, the application platform (or set of programs) that allows the delivery of courses in e-learning mode.

MOOC Massive Open Online Course [5]
Courses designed for distance learning that involves a large number of users.
Mooc differs from the classic online course for the following reasons:
- Content is accessible 24/7
- Media is open source
- Learners are encouraged to share and contribute materials
- Modules are 5 to 10 minutes
- Content is edited when needed
- Lectures are pre-recorded
- All content is available from the start
- Self-paced / customized learning path
- Feedback is dependent on classmates
- Course is open-ended with no due dates

On-line quiz
Methods of verification of distance learning, accessible from e-learning platforms used for teaching.

On-line Workshop
Starting from the traditional workshop, that is groups of people who work on a common project theme, addressing it with different approaches, the online workshop is nothing more than the same activity transferred in a virtual environment and carried out remotely, with the aid of multimedia tools and digital including those mentioned in the definitions, which allow interaction between the various users involved in the workshop itself.

Parallel Teaching*
Methods of teaching delivery that can be enjoyed both face to face and remotely.

QRcode
Code that can be scanned with a special reader or enabled smartphone, equipped with a link to web content that can also be consulted in augmented reality. Using the Internet of Things, by scanning the QRcode, it is possible to enter the architectural project and interact with the information contained therein.

Sharing community
Communities, actually groups of people, where information collected in the form of multimedia data is exchanged and shared, useful for increasing the thematic state of the art and one's own and collective know-how.

Sketchfab
Leading platform for 3d communication system and augmented reality.

Single sign on (SSO) *
Access control system that allows a user to perform a single authentication valid for multiple software systems or computer resources for which he is enabled.

Virtual and hybrid exhibition
A virtual exhibition (VE) was earlier defined as an online Web-based hypertextual dynamic collections devoted to a specific theme, topic, concept or idea (Silver, 1997)
A virtual exhibition (VE) is a Web-based hypermedia collection of captured or rendered multi-dimensional information objects, possibly stored in distributed networks, designed around a specific theme, topic concept or idea, and harnessed with state-of-art technology and architecture to deliver a user-centered and engaging experience of discovery, learning, contributing and being entertained through its nature of its dynamic product and service offerings (Foo, 2008).

Views board
Remote lesson program containing the activities planned within the educational course.

Virtual concepts board
Conceptual elaborate useful for the representation and transmission of contents in an effective and intiutive way. In architecture, it coincides with the manifesto table of the project, adapted to the requirements dictated by the multimedia transmission channels and used for the remote interface.

Virtual display gallery
Virtual exhibition spaces in which the subjects of a virtual exhibition are exhibited with which the user / observer / user can interact through the use of multimedia devices that enhance the senses.

Virtual rooms
Virtual classes of students configurable using special applications for remote meetings / lessons.

Notes and references

* The definitions are taken from the document "Post-Covid teaching" by the Working Group on post-Covid teaching set up by the Crui (Conference of Rectors of Italian Universities)

[1] National Evaluation Agency of the U niversity System and Research

[2] Freina, Laura; Ott, Michela (April 2015). "*A literature review on immersive virtual reality in education: state of the art and perspectives*". The International Scientific Conference Elearning and Software for Education. 1: 133–141.

[3] Camiz A., «A Distributed Virtual Learning Environment (DVLE) for a Constructively Aligned Architectural Design Studio» in *Manual of best practices for a blended flexible training activity in architecture for higher education institutions*, FAMagazine n.56-2021

[4] Ibidem

[5] Amistadi L., Prandi E., «The ArchéA online Course on the thems of Urban Design. A teaching/learning educational path» in *Manual of best practices for a blended flexible training activity in architecture for higher education institutions*, FAMagazine n.56-2021