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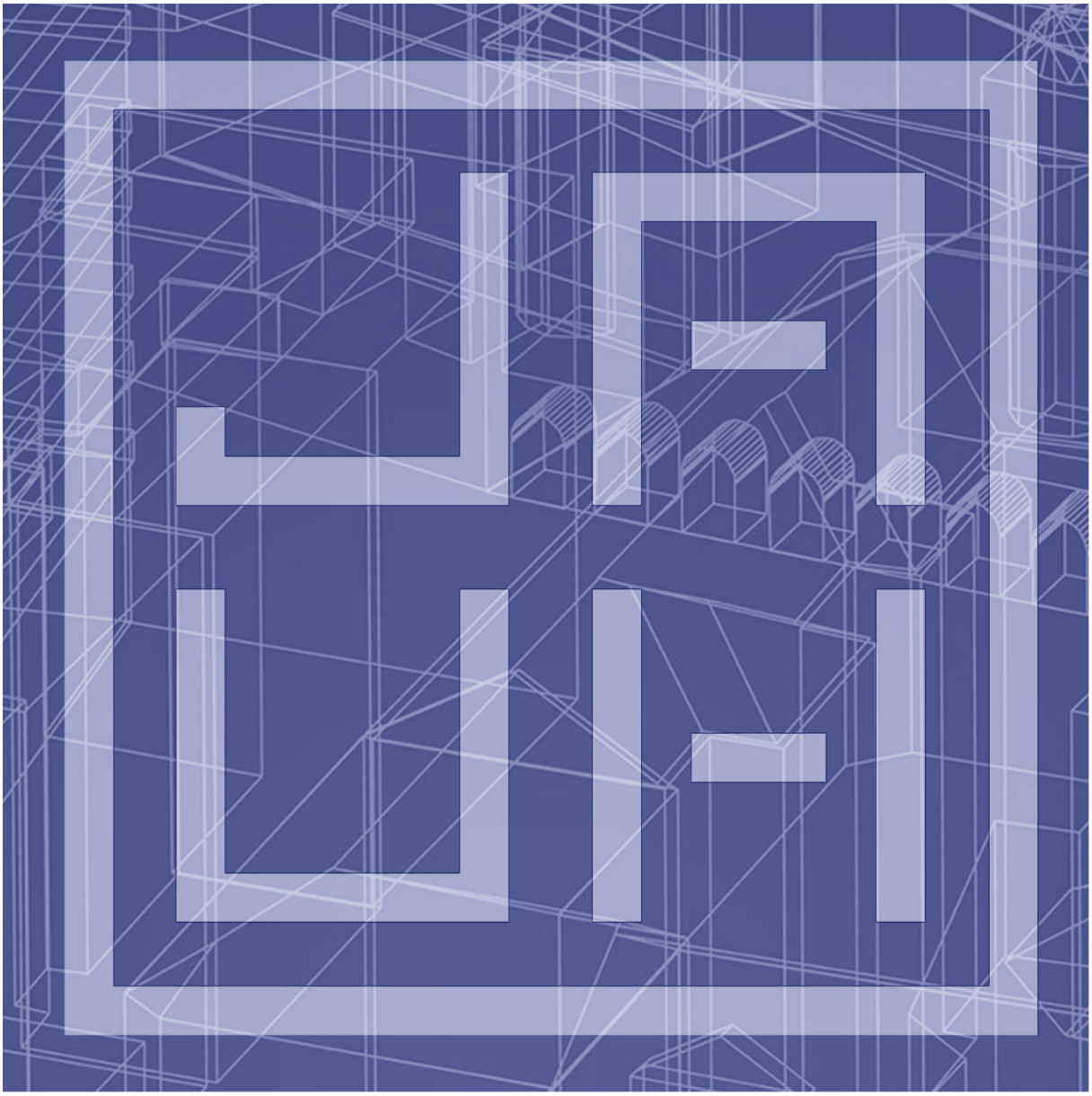

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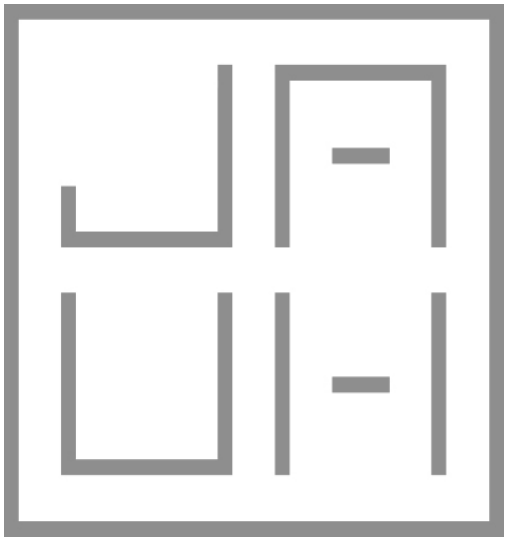

# Journal of Architecture Urbanism and Heritage

University Politehnica Timisoara Romania
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**Aims & scope**

The Journal of Architecture, Urbanism and Heritage is a peer-review academic journal which publishes original research papers and advances theory, research and practice in the fields of architecture and urban planning.

The interdisciplinary scholarly publication is aimed at advancing conceptual, scientific, and applied understandings of Architecture, Interior design, Urbanism, Built environment and Preservation and heritage studies.

Its articles include recent research findings, empirical research papers, theoretical and integrative review articles, book reviews and innovative new practices, creating a link between theory and practice, researchers and practicing professionals.

## Cohesion between professions / Overcoming disciplinary boundaries



## Contemporary approaches in architectural education



## Inter-, Multi-, and Transdisciplinary education



## Curriculum

# Cohesion between professions / Overcoming disciplinary boundaries

# Multiple study of mortars with the related impact application on old brick surfaces in historical buildings. Case study: Banloc Castle from Romania

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**ABSTRACT**
In recent years, an assiduous preoccupation has been the subject of restoring historic heritage buildings. In a high-quality restoration, specialists from different fields are involved, from archaeologists, historians, architects, to biologists and chemists, and many others.
In the arsenal of studies and analyzes preceding the determination of a correct restoration solution, the choice of materials compatible with the old support material is very important.
Thus, the present article focuses on the study and complex analysis of several types of mortars mixed with different percentages of nano-apatite class, in order to establish the composition with the maximum efficiency of resistance and durability, applied on the brick wall in the Banloc Castle.

**Keywords:** heritage, restoration, mortar, nano-apatite, investigation analysis

## 1 INTRODUCTION

The built cultural heritage constitutes an imprint of our cultural and national identity, of our history.

The study of the materials used in restoration is fundamental to understanding their behavior, as well as predicting the impact on the historical material. These studies can increase the knowledge of the materials and their performance. The development of materials used in construction should meet the criterion of resistance and durability, to face time and bad weather. In this context, mortars are elements of major importance, depending on the different uses in the construction and restoration process.

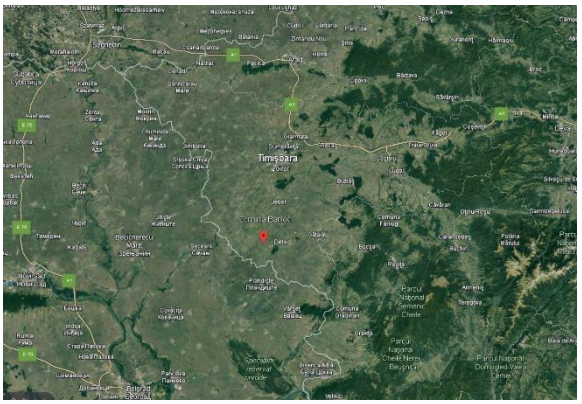



Fig.1 Banloc localisation

The present paper focuses on the Banloc Ensemble, located in west of Romania (Fig.1), approximately 43 km from the city of Timisoara and less than 11 km from the border with Sebia, in the town of Banloc, on the DN 59B national road, with access from the city of Deta [1].

Currently, the Ensemble contains five buildings, all disused and in a particularly advanced state of decay: the superintendent's house, the stable, the kitchen, the hunting lodge and finally the castle.

The studies in this work were carried out in the castle building.

The morphology has been investigated by optical, zoom microscopy, which revealed the colors, fissures, cracks and even holes of these samples due to the time weathering processes, and damages they suffered in time.

Also, a peeling method has been applied in order to evaluate the detachment possibility of these new restoration solutions.

Also, a peeling method has been applied in order to evaluate the detachment possibility of these new restoration solutions.

## 2 SHORT HISTORY

The Josephine map (1764-1785) reflects a specific character of the city's development in one organic mod. After the Ottoman Dominion, the village receives a new direction of military development, organizing itself in a rectangular system with perpendicular streets. There are several hypotheses that claim that between the years 1552-1717, the residence would be belonged to the pasha from Timișoara, used as a summer residence during the pasha's period Turkish [2]. After the expulsion of the Ottoman rule, Maria Theresia donated the lands and the domain, the Croatian Draskovich ban, in the exchange of territories of military importance. In 1785, Lázár Karátsonyi bought the estate in Banloc (Timiș county, Banat, Romania) from Draskovich.

Fig. 2. The north facade in 1914. Photo from the park. It can be seen part of the statues that decorated the park. Detail from a vintage illustration

His sun, Jenő developed the property of Banloc (Fig.2) and played a special role in the aristocratic society, through his marriage with Countess Karoline Andrassy; in 1896 they had as

guests: His Majesty King Franz Joseph I, and in 1908 King Alfons of Spain with his wife [3].
In 1935 the slightly damaged assembly was owned by the Romanian royal family, more precisely it is owned by King Carol's sister II, Princess Elizabeth, Queen of Greece.
In 1948, it started the worst deterioration of property. After the owner retires, the castle is looted in a series of acts of vandalism.
Then, all kinds of institutions work had headquarters in the expropriated building - an office agricultural, a home for the elderly and the edifice constantly degrading.
The final destruction was done by nature: the 1991 earthquake causes fatal damages to a neglected building complex.
From 2009 until now, the Romanian Orthodox Archdiocese of Timisoara owns the Banloc estate.

## 3 CASTLE PRESENTATION

### 3.1 Architecture and evolution in time

The mansion is on the main street, separated from it by a ditch with a footbridge. It has a simple geometric structure viewed from front, in a rectangular shape, and in the back, it continues on the sides with two arms, which forms a U-shaped inner courtyard (Fig.3). It is a typical shape chosen for a transpose all attention and all activity to the rear of the mansion, which thus it turns into the most important part, space in which it also unfolds the natural framework. The building itself was not from the beginning as it is now. Initially it had only the ground floor, then the first floor and the attic were built. Through the center a tunnel for carriages passed through it, from one end to the other, to the part of back. This was the original route and the main access to the mansion. Later, it was chosen closing this tunnel and turning it into a large central chamber, the access being on the side of the mansion and through the back, after entering through the two Egyptian gates located on either side of the castle.

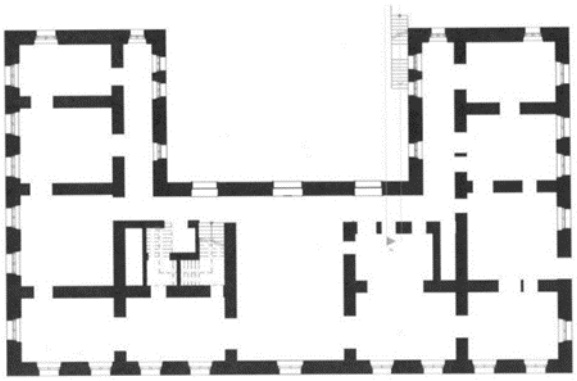


Fig. 3. First floor Plan of the Castle

On the outside, the mansion has a simple appearance, with repeated windows, and a decorative renaissance element on the attic, to indicate the viewer's point of interest, attached in the center, respectively the coat of arms of Count Eugen Karatsonyi's family. It decorates itself notice only in the old pictures, currently being non-existent. In the currently it is completely devoid of decorations, as well as chimneys.
The mansion is a building consisting of two equal parts, treated symmetrically both as a structure and as decoration. Also, the interior maintains the same principle of symmetry.
The building has a cellar, ground floor, first floor and attic. There is a central room each on the ground floor and floor, and the rest of the rooms unfold in mirror on the south line and the east wings and west. It is a massive building, originally with 31 rooms, with vaulted ceilings throughout surface. In the cellar and on the ground floor, Czech-style vaulted ceilings, in the upstairs hallways, vaults type lonengewaalbe mit STICHKAPPEN, and in rooms with "mirror" vaults (Spiegelgevaalbe). All rooms have doors that go from one to another, but there is also a corridor on the northern side, which gives access to all the rooms.

### 3.2 Materiality

The building has massive 1.25m brick walls. Sarpanta is elaborate, with a wooden structure and tile covering. Currently, no original finish is kept inside.

Fig. 4. Current situation of the Castle

Currently the building is abandoned (Fig.4).

### 3.3 Degradations

Degradations, both structural and non-structural, range from longitudinal cracks to masonry level, deep gaps up to the brick layer, detachment of the layer of color on the plaster, burns, adherent and non-adherent deposits, infiltrations both of vegetation, as well as humidity, efflorescence, oxidation.

In the following table (Table 1), several forms of degradation are identified, visually observed, within the framework of several studies and analyzes carried out in situ.

Table.1. The degradation types from Banloc Castle

| **Description of degradations** | **Identification of degradation causes** |
|---|---|
| Stuctural cracks | Due to uneven settlements and seismic actions |
| Degradation of cast ornaments, with missing fragments | Due to poor maintenance and vandalism |
| Unprotected masonry | Due to the loss of the finishing material and the loss of the material with the role of protection against the weather |
| Loss of weatherproofing material: rusted sheet metal elements, damaged gutters and missing downspouts | Because of poor maintenance and vandalism |
| Moving the perimeter walls out of the vertical plane | Seismic action, rotting of the eaves ends of the frame elements |
| Erosion | In the absence of plaster, the masonry is exposed to the weather for a long time, leading to erosion of the brick and mortar |
| Plaster exfoliation | Excessive humidity, wind action |
| Micro- and macrobiological colonization | Humidity from capillarity and in areas not protected by the cornice |
| Vegetation | Due to the abandonment of construction, the increase in humidity |
| Lack of external carpentry | Vandalism |
| Improper construction gaps | Faulty interventions |

## 4 MORTARS STUDIES

Twelve registers with mortars, with different concentrations of the nano-apatite class (HAp, size 70 nm [4 a,b], were applied *in situ*, on the brick, on the ground floor of the castle. Three types of mortars, from the Romanian trade, were used:

- Cement-based mortar;
- Lime-based mortar;
- Clay-based mortar, Fig. 5.

Fig. 5. Samples applied in situ, on the brick

In this work, only cement-based mortar cases will be presented. The others are subject to patents and cannot be disclosed.

### 4.1 Investigations

Several investigations were carried out on mortar samples applied in situ, on the 1st floor brick of the castle. After two months, the peeling tests have been applied and also, the microscopic evaluation have been analyzed and discussed.

### 4.2 Equipments and methods

**X-ray diffraction (XRD)** was recorded with a Rigaku Ultima IV X-ray diffractometer (Rigaku, Tokyo, Japan) with the following parameters: wavelength of Cu-Kα radiation (λ = 0.15406 nm), 40 kV and 30 mA.

The **wavelength-dispersive X-ray fluorescence (WDXRF)** measurements have been recorded with a Rigaku ZSX Primus II spectrometer (Rigaku, Tokyo, Japan) with a 4.0 kW Rh anode X-ray tube was used.

**Optical microscopy**: with a Novex trinocular microscope (Euromex Microscopen B.V., Arnhem, Holland) (magnifications: 40Å~, 100Å~, 400Å~, 1000Å~), equipped with a digital video camera (Axiocam 105, Zeiss, Göttingen, Germany).
**Stereo trinocular stereomicroscope** (EUROMEX Microscopen B.V., BD Arnhem, Holland), with a magnification degree of 7–45Å~.

**The peeling test** has been applied in order to evaluate the cohesion on the surface samples, after Drdácký et al. method [5], by using Scotch Cristal tape (3M) with 10 repetitions over the same location. After approximately 90 s of application, the tape was removed by taking hold of the free end and pulling it off steadily (not jerkily) at rate of about 10 mm/s and at an angle of 90°.
The percentage of consolidation (% C) was calculated according to the Equation (6) [6]:

$$\%\, C = (TRM_{untreated} - TRM_{treated})/ TRM_{untreated} * 100 \quad (6)$$

where:

$TRM_{untreated}$ is the total amount of material removed by peeling in the untreated sample, g

$TRM_{treated}$ is the total amount of material removed in the treated sample, g.

### 4.3 Results and discussions

Analyzing the XRF diagram we can see the majority presence of quartz (69%), then alumina from aluminosilicate, and berlinite (Table2.).
The brown color is given by the presence of manganese and iron oxides.

Table 2. The XRF data for the original brick

| Component | Result | Unit | Det. limit |
|---|---|---|---|
| **Na2O** | 2.2594 | mass% | 0.26546 |
| **MgO** | 1.6159 | mass% | 0.11212 |
| **Al2O3** | 16.9191 | mass% | 0.07634 |
| **SiO2** | 69.7976 | mass% | 0.13543 |
| **P2O5** | 0.1948 | mass% | 0.02498 |
| **SO3** | 0.0374 | mass% | 0.0171 |
| **K2O** | 2.3069 | mass% | 0.02461 |
| **CaO** | 1.3275 | mass% | 0.01938 |
| **TiO2** | 0.8864 | mass% | 0.05128 |
| **MnO** | 0.0807 | mass% | 0.01266 |
| **Fe2O3** | 4.4508 | mass% | 0.01536 |

In the below picture (Fig. 6), the diagram of the original brick is obtained by the X-Ray diffraction method. The mineralogic analysis allows the correct composition and help to the selection of the restoration receipt, because it offers information about the phase identification and quantification of crystalline compounds and the crystallite size of the material [7]. Quartz, berlinite, aluminosilicates from clays, and a manganese mineral, all of these have been identified. Berlinite's presence is yet another proof of the stability over time of the mortar used at this monument.

By analyzing the below table (Table3.), the following aspects have been observed:

a) The appearance of the mortar immediately after application.

b) The appearance of the mortar after drying, for all four cases studied:

1. dry mortar
2. mortar with 10% HAp
3. mortar with 20% HAp
4. mortar with 30% HAp

Optical microscopy is used to identify and examine concrete deterioration due to sulfate attack, freeze-thaw damage, corrosion of reinforcement, and more complex causes of deterioration. Optical microscopy usually provides information on the compositional homogeneity of the mineral/inorganic material. Optical microscopy is also a suitable method for diagnosing the historical degradation of mortar and studying the interphase zone together with the potential products of the reaction between the binder and aggregates, bricks or building stones, especially in the form of well-rounded limestone granules.

Analyzing the initial samples, by OM it was observed that the dominant mineral in the aggregates was quartz (70% by volume), and the following aspects can be observed:

Polycrystalline grains, consisting of many small after application domains characterized by wavy extinction, were also observed.

The composition of the aggregate was completed by particles of sandstone and feldspar (aluminosilicate), with slightly less limestone granules.

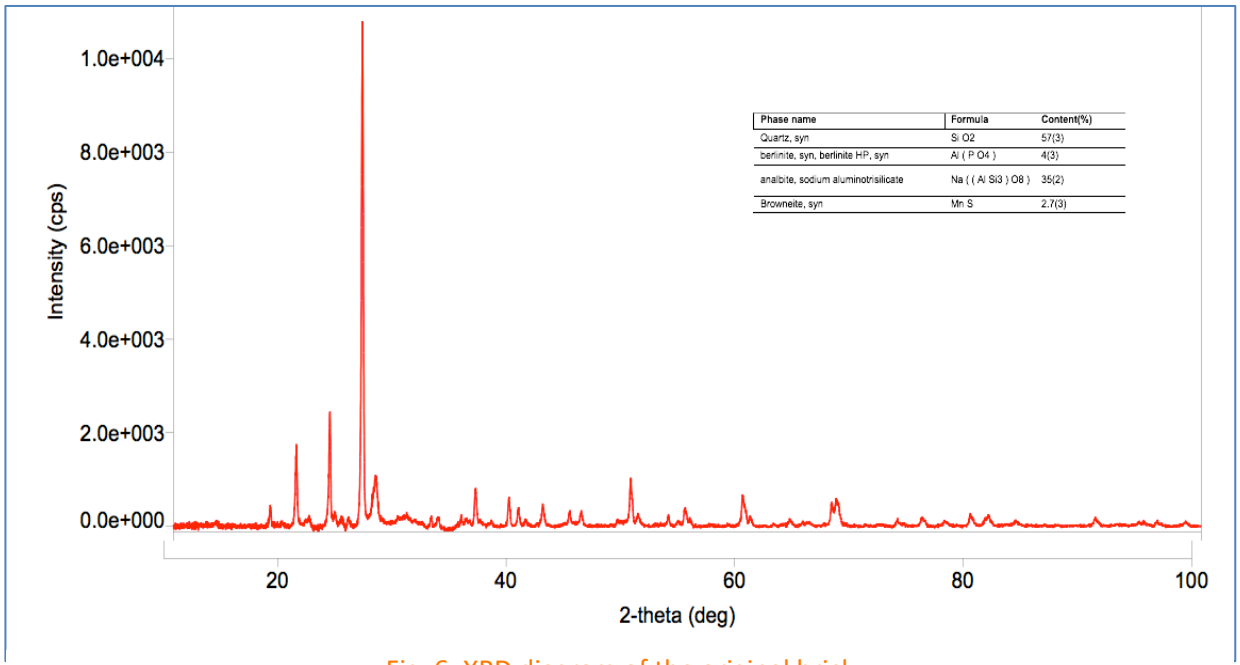
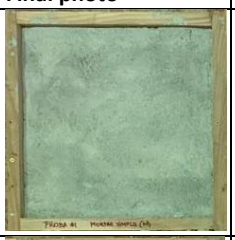
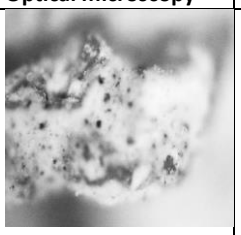
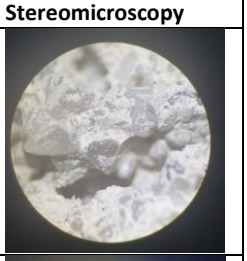
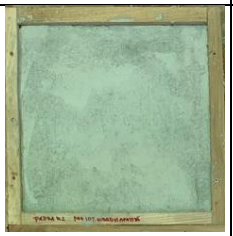
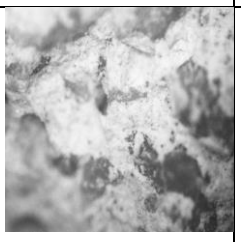
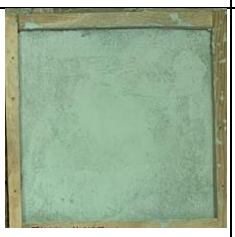
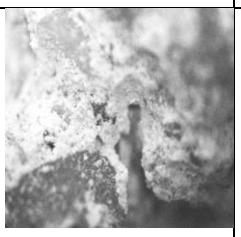
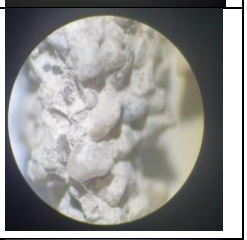
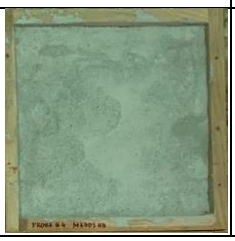
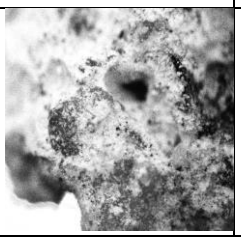



Fig. 6. XRD diagram of the original brick

Table 3. The centralized images

| Sample | Composition | Initial photo | Final photo | Optical microscopy | Stereomicroscopy |
|---|---|---|---|---|---|
| 1 | Simple mortar |  |  |  |  |
| | Mortar+10%HAp |  |  |  |  |
| | Mortar+20% HAp |  |  |  |  |
| | Mortar+30%HAp |  |  |  |  |

From the images obtained, the presence of quartz can be visualized, and the images reveal inhomogeneous surfaces, with imperfections given to the crystals present (aluminosilicate). Stereomicroscopy images revealed the presence of HAp, like a powdery coating that covers like a canvas the surface of the mortar. This is responsible for the chemical and microbiological stability of the mortar studied.

The stability of this mortar with HAp could be tested by peeling test, and the value (%C = 28%) proof the best stability for mortar with 10%HAp.

## 5 CONCLUSIONS

The present paper focuses on the study and complex analysis of several types of mortars mixed with different percentages of strengthen from nano-apatite class, in order to establish the composition with the maximum efficiency of resistance and durability, applied on the brick wall in the Banloc Castle.

## 6 ACKNOWLEDGMENTS

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PICTURES

1.https://earth.google.com/web/search/Banloc/
2. Author's private collection
3.Author
4.https://turismtimis.ro/obiective-turistice/castelul-banloc/
5. Author private collection
6. Author

# Mathematics and Programming in Architectural Education: a transdisciplinary workflow

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**ABSTRACT**
Architectural studies involve a student's endeavour into various other subjects, this paper paying particular attention to the importance of mathematics and programming in shaping an architect's mindset. The increased focus on this area is motivated by the demands of the job market, where analytical skills are desirable in architectural design. Moreover, architectural education institutions in Europe include such disciplines in the curriculum (robotics, programming and algorithms, building automation, etc.). The study presents how a mathematical understanding of requirements, pragmatism and a critical eye can accompany the poetic, sensitive side of future architects. The workflow is focused in formulating the design theme in architectural terms as well as in programming syntax and comparing the two possible outcomes. The used environments are a computer aided design tool such as Revit or Rhino together with a programming language such as C# or Python inside Grasshopper. The study emphasizes the similarities in thinking and reasoning, on one hand, the design process, and on the other hand, the problem from a mathematical and programming point of view. The importance and the benefits of blending mathematics, programming and computer science in architectural education are presented. On a broader picture, technologies such as artificial intelligence can aid the architecture students if basic knowledge of mathematics and programming are at hand as computational thinking helps in grounding the desired skills and growing a sustainable mindset focused towards efficiency and optimality. The study offers an intuition on how architecture education can adapt to the new technologies and ambitions of the future, thus grooming students into understanding and embracing technology.

**Keywords:** architecture, mathematics, programming, architecture education, design process

## 1 INTRODUCTION

Constantly changing and adapting, education has to fulfil the necessity of anchoring the students into mindsets and practices oriented towards the future. Learning architecture is a challenge due to multiple reasons, one being the confluence of several disciplines that shape the process of design while being fundamentally different: physics, arts, structural engineering, material engineering, theory, psychology, mathematics and, with a consistently growing impact in the last few decades, informatics and computer science.

The latter is seen in practice as having important benefits, especially in the fourth industrial revolution and the desire to automate tasks and processes, thus obtaining optimality and efficiency. The Fourth Industrial Revolution, or Industry 4.0, is a term used to refer to the way in which contemporary society is produced and organised, emerging with the notion of the internet of things. Automation, the use of intelligent machines, and the efficiency of production and consumption are characteristic, presenting today solutions that are related to artificial intelligence (AI) and incorporate advanced software and hardware technologies [1, p. 197].

An integrating method of using computation in architecture education and practice is aimed globally [2, p. 810], thus understanding the underlaying principles of automation is becoming more and more important.

Many academic institutions teaching architecture include in their curriculum courses on topics related to technology and computing that require a medium level of understating computation: digital fabrication, algorithmic design, artificial intelligence, etc. This article refers to disciplines that involve some mathematic knowledge and already included in some of the faculty's curriculum. The role of mathematics in computer aided design software such as AutoCad, ArchiCad, Revit or similar is essential however, the user is not required to have an understanding on that. Discussions on this matter will be limited as it sits outside the scope of this article.

Table 1 Universities and programs including mathematics and programming knowledge

| Academic institution | Course / program |
|---|---|
| University of Stuttgart | The Integrative Technologies & Architectural Design Research M.Sc. Program |
| MIT Architecture | SMArchS in Computation |
| Institute for Advanced Architecture of Catalonia | Master in Advanced Computation for Architecture & Design |
| The Bartlett School of Architecture | Architectural Computation MSc/MRes |
| Technische Universität Berlin | Design and Computation – MA |
| Royal Danish Academy, Institute of Architecture and Technology | Computation in Architecture - MA |

The integration of high-level computation techniques in architectural design education is the result of the usefulness of parametric design. Parameters, coming from the field of mathematics, are defined by the Oxford dictionary as "a numerical or other measurable factor forming one of a set that defines a system or sets the conditions of its operation". Working with parameters, one has to define rules and logical operation rather than do geometric drawings. As such, Grasshopper is a preferred tool, involving an intuitive mathematical knowledge rather than pure theory. Moving forward to a straight use of mathematical model involving functions, algorithms, variables, etc., programming syntax can be used.

Further on, a transdisciplinary workflow is developed for studying a design theme that is based on a clear set of rules. The new approach, involving a programming exercise that complements the traditional design process, implies basic knowledge of architecture composition principles, analytic geometry, algebra and object-oriented programming.

In the first stage of design, the architecture student is on an exploratory quest and one of the ideation techniques implies a degree of randomness in brainstorming. Introducing a stochastic behaviour in finding conceptual solutions for a generic composition can unleash the creative mind and can physically be achieved when working with models and mock-ups as in Fig. 1. Moving modules and trying different

arrangements is a first exercise to immediately visualise a possible direction or solution. Creativity can be stimulated in an apparently chaotic, messy incipient process that provokes debates and critical thinking, such as throwing volumes on a table and letting gravity do the rest. The composition produced sits outside architectural design principles or any defined purpose, targeting an extensive look into unbiased and unrestricted possibilities. Encoding this hazard and involving randomness into the process can be simulated by establishing a set of rules that allow for a random behaviour while framing the design theme. In this article a possible workflow is presented, making use of mathematic knowledge and programming for encoding rules and processes.

Fig. 1 Student projects with volumetric composition, involving an exploratory first step with a degree of randomness

## 2 METHOD

The relevance and impact of mathematical thinking and programming in architecture education is discussed by developing and observing the potential of these skills in the design studio during the 1st year at the faculty of architecture. The workflow starts form the ideation and reasoning part, problem formulation and them problem translation from architecture terms to programming syntax and analytic geometry.

### 2.1 Case study – volumetric composition

Students in the 1st year of studies have the task of designing a volumetric composition with several given **solids as rectangular prisms**:

- two rectangular prisms measuring 30 x 60 x 120 mm,
- a cube of 60 mm side,
- 10 cubes of 30 mm side,
- 10 modular horizontal tiles (30 x 60 mm), 5 mm thick.

The composition theme gives two limitations:

- volumes cannot intersect,
- the composition has to fit in a box measuring 420 x 420 x 400 mm.

A traditional design strategy involves manufacturing the prisms and trying different setups on which to discuss the architecture features. The newly proposed workflow encodes the given starting rules and transfers them into C# to automatically generate various arrangements of the solids.

### 2.2 Analysis, Interpretation of design theme and strategy

First step is to formulate the problem and ways to obtain possible solutions using the skills desired (code in C# inside Grasshopper). The prisms' geometry has to be mathematically described into code or equivalently use libraries containing classes corresponding with the desired solids, in object-oriented programming. Thus, objects that contain both functions and data are created [3]. Grasshopper makes use of Rhino Application Programming Interface together with its classes, methods and attributes

[4]. The Rhino namespace, being the library with all the classes implemented in Rhino, contains the sub-namespace Rhino. Geometry, in which one can find geometries such as boxes, curves, etc. and geometric transformations like homotheties, rotations, symmetry and others.
Being familiar with such transformations of shapes and their implementation in C#, a interpretation of the design theme can be formulated.
The prisms are all objects from the box class, with different values for the attributes giving the length, depth, and height of the box.
The next step is encoding the rules. Fitting the whole composition in a defined volume measuring 420 x 420 x 400 mm is equivalent to saying that each prism is contained by the boundary volume. In code, this can lead to two possibilities:

1. checking for each prism if it is inside the boundary box, meaning checking if the coordinates of the points giving the corners of the prism exceed the coordinates of the bounding volume;
2. limiting the anchor points in which each prism can be placed and only after that placing the solids - as a result, from the beginning one has the guarantee of correctly framing the composition.

The next rule says that intersection on volumes is forbidden. According to the strategy adopted when composing the volumetry, this can be encoded intro different ways:

1. putting all prisms in the bounding volume and after that checking all solids, two by two, if they intersect - mathematically, this means comparing points coordinates;
2. gradually introducing the prisms into the bounding volume and checking at each step if the position is valid.

At this step it is conclusive to frame the strategy. According to the purpose of the exercise, **the workflow has to automate the generation of such compositions**. A decision is made on the process evolution: the composition will be randomly generated in several instances, by a set number of times. The composition is obtained by gradually introducing prisms in a way that respects the given restrictions. Each prism can be placed in the composition by anchoring its origin to a point inside the bounding volume. Having dimensions of 42 x 42 x 40 cm, this gives $42 * 42 * 40 = 70\,560$ possible anchor points for the first solid. To reduce complexity, the point coordinates will be numbers multiple of 3 cm. This way, the possibilities are reduced to 2548. Moreover, the origin of the prism is considered at one of its lower corners. When randomly picking an anchor point inside the bounding volume that is multiple of 30 in its coordinates, the randomly generated coordinates will take into account the dimensions of the prism introduced and reduce even more the bounding volume so the superior limits of the prism will not outgrow the initial limit of 420 x 420 x 400 mm.
The evolution of the program is as follows: a first volume of dimensions 30x60x120 mm is inserted in a randomly picked point that has the z coordinate equal to zero and is inside the bounding volume. After that, the second prism with dimensions 120x60x30 mm (being a rotation of the given 30 x 60 x 120 mm rectangular prism) is inserted by its anchor point. After its insertion, the intersection condition if verified. Following, a next rectangular prism of 60x60x60 mm is inserted and verified for intersection conditions. All small cubes of 30x30x30 mm are inserted and intersection conditions are verified. The last step is introducing the three rectangular prisms of 30x60x5 mm and verifying intersection conditions.
The strategy for random composition generation dictates the steps for implementing a C# code inside Grasshopper. This workflow is favourable because it gives the Rhino libraries, which are advanced spatial modelling and analysis software libraries, the possibility to immediately visualise the outcome of the piece of code. Another possibility is to use MatLab or Octave, each having its specific syntax and libraries. Several software and programming language options are available, while making use of the resources aimed in Fig. 2. Being frequently used in architectural design, it is preferred to show extended possibilities of using Grasshopper.

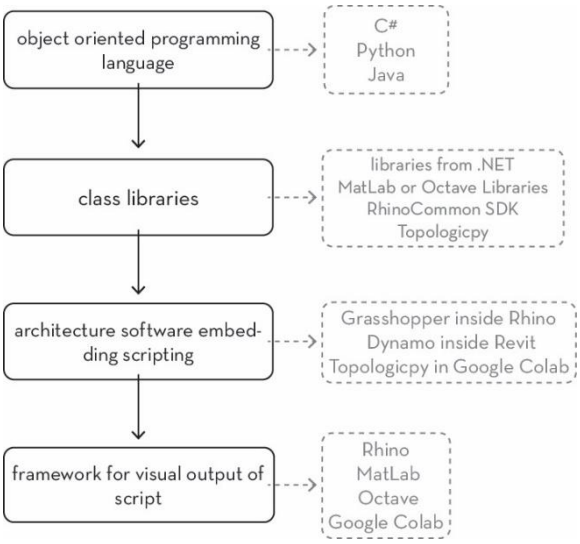


Fig. 2 Resources for a transdisciplinary workflow involving programming

## 2.3 Algorithmic design

Based on the strategy formulated after rethinking the design theme in terms of rules and processes, the code in C# is written according to the object oriented programming principles: abstraction, encapsulation, inheritance, polymorphism [5].
At first, the needed classes are defined, with their attributes, constructors and methods. That is the class for the rectangular prisms, that has to contain information as follows:

- attributes: the origin point that is anchored to one of the possible points inside the bounding volume, the dimensions of the prism;
- constructors: rectangular prism given by its dimensions and a given origin, rectangular prism given by its dimensions and a random origin;
- methods: boolean function checking if a point is inside a given volume, boolen function checking if two prisms intersect, void function setting the dimensions and origin of an rectangular prism.

The steps described in the previous subsection are encoded in the running script. All the given prisms are stored in a vector that will be the output of the programme for the Grasshopper algorithm. This way, the composition will be computed and visualised in an instance.

Adopting as resources the C# syntax language is compatible with Rhinos software development kit (SDK), which is a low-level .NET cross-platform called RhinoCommon [6]. Since Grasshopper, as a visual programming language, is written on the same RhinoCommon and is commonly used by architects, digging deeper into the used framework gives extensive access to Rhino and its classes, which are well designed for manipulating geometry.

## 2.4 Observations and critical thinking

After multiple generations of random volumetric composition respecting the design theme requirements, a discussion is started with the students, divided on two branches: methodology and quality in design. The focus is, on a methodical point of view, on processes involved in design, ways of reasoning and having a good understating of possible strategies and workflows.
On a qualitative and critical perspective, the outcome of a process is evaluated by architectural criteria, meaning unity, hierarchy, balance, proportions.

# 3 RESULTS – a transdisciplinary workflow

The mind and the computer have different ways of producing permutations of a set of prisms and algorithmic design can accompany the student in the search of possibilities. By scripting the process of making the volumetric composition with clear requirements, one can sift through endless possibilities and unlock ideas. When creating such a piece of code, the aim is to explore and not to push decision making towards automation. The student can automate the process, while maintaining a critical attitude and a capacity to evaluate the results.

### 3.1 The C# implementation

The class BoxF, described in the Unified Modelling Language (UML) Diagram at Fig. 3, shown in Fig. 4, has attributes containing dimensions (a, b, c), origin point and the geometry as object from the class *BoundingBox* from *Rhino.Geometry* namespace. Diametral opposed to the origin is a second corner of interest, with the two framing the rectangular prism as a *BoundingBox*.

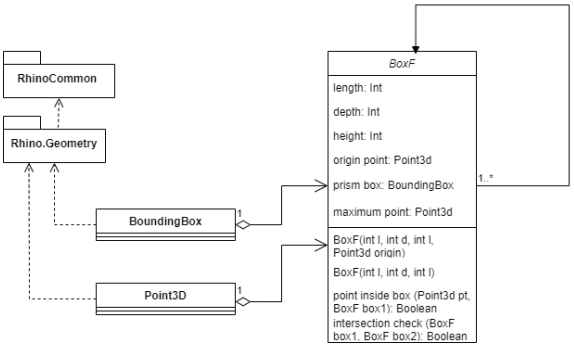


Fig. 3 UML Diagram for classes and libraries used

For creating an object of the class *BoxF*, meaning an instance of a rectangular prism with given values for its attributes, a constructor, which is a function of these values, is used. The constructor can receive the origin of the prism or can assign a random origin respecting the decisions taken in the interpretation of design theme phase (coordinates are numbers multiples of 30 mm, the prism is enclosed in the boundary volume), as in Fig. 5.

```
public class BoxF{ // create a box with all atributes needed

  public int a;
  public int b;
  public int c;
  public Point3d origine; //the origin on the box is point into one corner is placed, as an archor point
  public BoundingBox BB; // the box using BoundingBox class from Rhino.Geometry namespace
  public Point3d ptmax;
```

Fig. 4 Code snippet - defining class named BoxF for the rectangular prisms

```
public BoxF(int x, int y, int z, Point3d o){ //inserting a box solid with given depth, length and height and the anchor point
  this.a = x; this.b = y; this.c = z; this.origine = o;
  ptmax = new Point3d(this.origine.X + this.a, this.origine.Y + this.b, this.origine.Z + this.c); //the corner opposed to the origin corner
  BB = new BoundingBox(origine, ptmax);
  BBOX = new Box(this.BB);
}

public BoxF(int x, int y, int z){ //randomely generating the starting point, within the bounding volume
  this.a = x; this.b = y; this.c = z;
  this.origine = new Point3d(0, 0, 0);
```

Fig. 5 Code snippet - defining constructors for class BoxF

```
public bool verif_point_int_box(Point3d pt, BoxF box1)
{

  if(box1.origine.X <= pt.X && pt.X <= box1.origine.X + box1.a
    && box1.origine.Y <= pt.Y && pt.Y <= box1.origine.Y + box1.b
    && box1.origine.Z <= pt.Z && pt.Z <= box1.origine.Z + box1.c)
    return true; //returns true if the point is inside the box
  return false;
}


public bool verif(BoxF box2) //checking if the solid is inside the bounding volume given as box2
{
  BoxF box1 = this;
  Point3d box1_1 = box1.origine;
  Point3d box1_2 = new Point3d(box1.origine.X + box1.a, box1.origine.Y, box1.origine.Z);
  Point3d box1_3 = new Point3d(box1.origine.X, box1.origine.Y + box1.b, box1.origine.Z);
  Point3d box1_4 = new Point3d(box1.origine.X + box1.a, box1.origine.Y + box1.b, box1.origine.Z);
  Point3d box1_5 = new Point3d(box1.origine.X, box1.origine.Y, box1.origine.Z + box1.c);
  Point3d box1_6 = new Point3d(box1.origine.X + box1.a, box1.origine.Y, box1.origine.Z + box1.c);
  Point3d box1_7 = new Point3d(box1.origine.X + box1.a, box1.origine.Y + box1.b, box1.origine.Z + box1.c);


  if(this.verif_point_int_box(box1_1, box2)) return false;
  if(this.verif_point_int_box(box1_2, box2)) return false;// box location is wrong
  if(this.verif_point_int_box(box1_3, box2)) return false;
  if(this.verif_point_int_box(box1_4, box2)) return false;
  if(this.verif_point_int_box(box1_5, box2)) return false;
  if(this.verif_point_int_box(box1_6, box2)) return false;
  if(this.verif_point_int_box(box1_7, box2)) return false;


  return true; //solids do not intersect
}
```

Fig. 6 Code snippet - testing if two rectangular prisms intersect

The method used to verify if two prisms intersect each other is defined in the *BoxF* class. Firstly, it is written a function checking if a point is inside a box by comparing coordinates on the three dimensions (x, y and z) with the domain of the bounding volume. Secondly, the function is used inside a method that tests if two given prisms intersect by testing if several points contained in the first prism, such as the corners, are inside the second prims (Fig. 6).

In the running script, a vector with 12 elements as *BoxF* is declared, following the steps described in the methodology.

Let's take the 6 cubes measuring 30x30x30 mm – Sequentially, they are inserted in the bounding volume by giving a random origin that satisfies the limits. At each insertion, the intersection condition is checked. If false, meaning volumes intersect, the prism is recalculated, as in Fig. 7.

```
for(i = 3;i < 9;i++){ //all 6 small volumes of 30x30x30 are inserted
  ok = false;  crt = 0;
  while(ok == false && crt < 20)//the trials are maximum 20
  {
    R[i].setBoxF(30, //dimensions
      30,
      30,
      Convert.ToInt32(rnd.Next(30, 420 - 120) / 30) * 30, //random origin
      Convert.ToInt32(rnd.Next(30, 420 - 120) / 30) * 30,
      Convert.ToInt32(rnd.Next(0, 60) / 30) * 30);
    for(int j = 0;j < i;j++)
    {
      ok = R[i].verif(R[j]); //all intersections are verified
      if(ok == false) j = i + 1;
    }


    crt++;
  }
}
```

Fig. 7 Script snippet - Inserting cubes measuring 30x30x30 mm

## 3.2 Various volumetric compositions and two approaches

The resulting composition can immediately be visualised in Rhino by using C# as a node in Grasshopper, giving as output the box geometry defined in Rhino (Fig. 8).

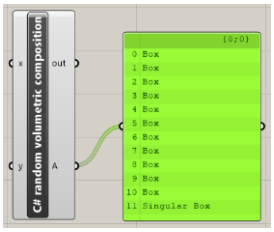


Fig. 8 C# inside Grasshopper (inside Rhino)

The composition is iterated as many times as required, offering a different solution at each loop. The major outcome is an unbiased new set of solutions. The randomness of the generation calculus exposes the student to multiple solutions, unlocking ideas and showing variation on a set of rules. It is up to the imagination and understanding of the student to find meaning and evaluate the compositions: compositional axes, horizontal and vertical proportions, rhythm, hierarchy, highlights, space between solids. The possibility to analyse a large set of samples helps the learner to ground principles used when thinking how to design and how a certain form is obtained. Having the programming workflow, one can compare two different approaches:

- architectural logic: starting form a concept and tracing certain principles;
- reduced programming logic: starting from the given rules to generate different arrangements, without an early idea (Fig. 9).

The students can analyse the generated compositions by asking: Can design principles be found in such composition? Does it reveal ideas? It is pleasantly looking? If so, what is the reason?

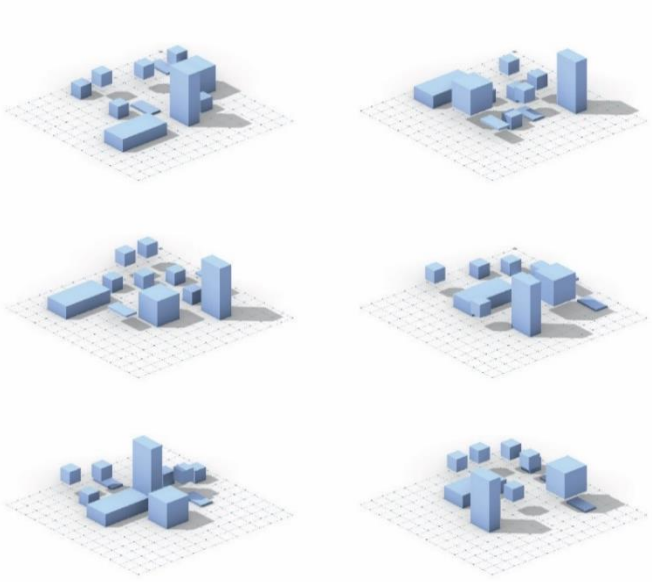

Fig. 9 Examples of volumetric compositions generated with C#

## 3.3 Common concepts

Common concepts in architecture, mathematical reasoning and programming are given by abstract thinking, orientation towards problem solving, desire to analyse and prove, keeping it simple but not plain, clarity in inference. A mathematician and a programmer would constantly try to find and express the solution for a problem in explicit, concise, efficient and spectacular terms. Similarly, an architect would seek the same outcome in the process, eventually shaping the end result.

In the timeline of discoveries in mathematics, one observes an **evolution from static to dynamic**, respectively from contemplative to constructive, under the transition from the

mathematics of antiquity to that which followed the Renaissance until modern times [7, p. 34]. This approach is similar in fields such as architecture, **achieving a great flexibility and abstraction in thinking and practice** being possible at a slower rate.

For example, similar steps in thinking are observed when searching for solutions at the two following problems:

- architectural logic - how to test the right fitting of a vertical highlight in a volumetric composition,
- mathematical logic - how to test if two solids intersect each other: 3d orientation, referring to surrounding entities (buildings / volumes or points), analysing the domain of possibilities, deciding a set of guidelines, abstracting and reducing complexity, linking cause to effect.

## 4 CONCLUSIONS

Being at the core of programming and mathematics, a simple exercise like this can pave the way to an understanding of computation and its potential use in architecture. By reducing complexity and involving the students directly into programming, the underlying logic of computational thinking is emphasised as a soft skill that is highly needed in the present context. From simple to complex, by amplifying the logic and reasoning involved in such exercises, the topic of artificial intelligence can be reached. With an outstanding impact in the recent years, AI is both a great resource and a dangerous threat. When correctly understood and used, it can lead to a creative or optimizing experience. On the other hand, the risk is supressing students' enthusiasm and motivation on misbelieves such as the potential for AI to turn architects obsolete. At first, developing an intuition on basic computation and encouraging the student to pervade in the domain of advanced computation, involving mathematics, supports an effective and realistic adaptation to new technologies.

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# Facilitating the transition from specialized Secondary Education to Higher Education in architecture: A case study of a collaborative model making method

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## ABSTRACT

This paper addresses the subject of facilitating the transition of students from specialized upper secondary education in art and architecture to higher architectural education through model-making activities conducted in a collaborative context, organized as a co-operation process involving high-school students, university students and academic staff.

The teaching method based on creating physical models with a given theme aims to expose participants to the three specific processes of architectural project development: imagining, learning, and fabrication. The act of collective creation, seen as a didactic strategy, involves training mixed groups to achieve a common goal through social interaction, continuous exchange of ideas, negotiation, and each member taking responsibility for the result in all stages - from the initial idea to its physical materialization.

In this sense, the Faculty of Architecture and Urban Planning in Timisoara has developed the "Maker@ARChA" project, funded by the Ministry of Education through the national program to support extracurricular activities. It is part of an extensive series of projects and non-formal education activities that involve the participation of academic staff, their own students, as well as groups of students from outside, with the purpose of developing architecture-related skills. Maker@ARChA proposes workshop activities organized in two one-day sessions, each with a given theme that focuses on creating an articulated object generated through compositional methods based on the principle of fractal form, using DIY tools. At the end of the sessions, the teams made oral presentations regarding their work to practice communication skills. Each workshop concluded with a photo session that highlighted the diverse ways surfaces and volumes appear depending on the position, intensity, and color of the light source.

The results obtained reveal an increase in the manual skills and communication abilities of the participants, a high level of creativity in interpreting the given themes, and a willingness to collaborate in the creation process specific to each team.

**Keywords:** architecture design, non-formal education, model-making, co-creation, compositional methods, manual skills, communication skills

## 1 INTRODUCTION

There have been models made for architectural objects since prehistoric times [1], but in the educational environment, the making of models is specific to architecture and design faculties and is also present in high schools with specialized classes. In general, making prototypes helps the design process, reduces the possibility of a deadlock, and strengthens confidence in one's creative abilities [2].

In fine arts high schools without specialized classes in architecture or design, the practice of three-dimensional models is less common. It is used primarily to simulate large sculptures on a smaller scale. Otherwise, exercises that involve three-dimensional modeling using real materials generate artistic objects in themselves, on a 1:1 scale, and generally belong to the genre of sculpture, along with its subgenres.

Psychologically, the modeling experience is satisfying [2]. To facilitate the transition of students from specialized upper secondary education in art and architecture to higher architectural education, Maker@ARChA proposes model-making activities conducted in a collaborative context, organized as a cooperative process involving high school students, university students, and academic staff.

In the spring of 2023, the Faculty of Architecture and Urban Planning in Timisoara developed the "Maker@ARChA" project, funded by the Ministry of Education through the national program to support extracurricular activities. It is part of an extensive series of projects and non-formal education activities involving the participation of academic staff, their students, and groups of students from outside, with the purpose of developing architecture-related skills.

## 2 PURPOSE OF THE WORKSHOP

The purpose of the workshops conducted by Maker@ARChA is to acquaint high school students with the execution and presentation of study models using modeling tools. This aims to enhance their manual skills in an era where such skills are often hindered by excessive digitization. Additionally, these workshops promote communication and stimulate creativity in the field of architecture. Although termed "rapid prototyping," for simple models, computer modeling and digital manufacturing may not provide the necessary speed for efficient work, potentially leading to the phenomenon known as the Ideation Gap [3].

Model building offers students the potential to generate, visualize, and evaluate design ideas. It can also help identify flaws in initial sketches and ideas, as well as explore the differences between real-world behavior and the conceptual models used to predict that behavior [4].

These workshops aim to enhance the manual skills, communication abilities, creativity, and collaborative spirit of the participants, ensuring that each team excels in the specific creation process associated with their project.

## 3 THEME OF THE WORKSHOP

The teaching method, which involves creating physical models with a given theme, aims to introduce participants to the three specific processes of architectural project development: imagining, learning, and fabrication. This method treats collective creation as a didactic strategy, involving mixed groups in achieving a common goal through social interaction, continuous exchange of ideas, negotiation, and each member taking responsibility for all stages - from the initial idea to its physical materialization.

Maker@ARChA offers workshop activities organized into two one-day sessions, each centered around a specific theme focusing on creating articulated objects using compositional methods based on the principle of fractal forms and DIY tools.

For the two sessions held on June 9 with students from the Arts High School in Reșita, and on June 16 with students from the National College of Arts in Baia Mare, the theme was the same. It involved creating articulated objects through compositional methods based on the principle of fractal form, using DIY and specific tools.

After explaining the principles of fractal shapes, students were tasked with imagining an object using only one type of polygonal geometric shape (e.g., square, rectangle, triangle, quadrilateral, etc.). This object was generated with volumetric components that, as they decreased in size, increased in number. The object was designed to

be articulated, with component parts interconnected in a way that allowed for increased freedom of movement, rather than being statically glued together. The resulting creations were expected to exhibit dynamic forms and were entirely white. The interplay of light on their surfaces and volumes would transform them into reflective celestial bodies, resembling moons. This exercise aimed to deepen students' understanding of how light and shadow contribute to the perception of volumetric qualities.

The resulting works were not intended to be models of larger architectural or sculptural projects; instead, the object itself was the artistic product. Among the less traditional sculptural subgenres (such as assemblage, articulated objects, and installations), this experiment falls into the articulated object category.

The theme originates from an exercise conducted with students from FAUT (Faculty of Architecture and Urban Plnning in Timisoara). However, it differs significantly. In FAUT, the theme of the articulated object is part of the Study of Form subject in the 1st semester of the 2nd year of the specialization "Furniture and Interior Design." The theme results in a vertical object 70 cm high, with ensured statics, made by assembling 7 volumes of different shapes, sizes, and materials connected by thin rods, typically made of metal. The works expected to be created within the Maker@ARChA workshops are still articulated objects but with unique materiality (connecting elements, if needed will have a minimal influence), a greater number of elements, and using a single seminal form.

## 4 THE PROCESS

The two sessions began with a presentation of the assignment by the coordinating professors from FAUT. Since the principle of fractal structuring of the form represented a new concept for the students, a short session of questions and answers followed. At the same time, the principle of articulating the pieces was explained, drawing comparisons with addition, connection, or intersection.

Work materials and tools were introduced, and even though the handling of dangerous tools was to be done by the coordinating teachers, the entire group received instructions on work safety. Since the two groups each consisted of 14 high school students, they were divided into five groups of 2-3 students each (four groups of three and one group of two), taking into consideration their preferences and the fact that they knew each other as schoolmates. Additionally, three students from FAUT from different years of study were integrated among the students to help generate ideas, facilitate the realization of the works, and promote the exchange of ideas and communication between different generations. The idea was for students to obtain information about what is happening in the Faculty of Architecture directly from the source.

To foster a collaborative and familiar atmosphere, everyone received badges with their first names written on them.

In the first stage, the groups had to create hand sketches on paper for the future objects that would materialize in three dimensions. The time allocated for this was limited to a maximum of half an hour to preserve the freshness of ideas without inhibiting potential details.

After selecting the formal category according to the rule by which the objects were to be generated, the students were asked to provide a list of the required pieces, specifying their shape, dimensions, and quantity.

High-density expanded polystyrene boards, EPS 100, with thicknesses of 100 and 50 mm, along with thin wooden sticks, were used to carry out the works. For cutting, hot wire cutting devices, specifically the Proxxon Thermocut TA 300, were employed, complete with guides for straight angle cuts and compound angle cuts.

The cutting of the component parts was carried out by the instructors, with the students closely observing the process. In some cases, the students insisted on cutting certain parts themselves to gain experience with unfamiliar tools. These instances were done under the careful supervision of the coordinating teachers from FAUT. After an hour and a half of teamwork, there was a lunch break of approximately 45 minutes, during which informal discussions took place among all the participants in the workshop. Following the break, the work resumed.

The parts were fabricated during the assembly of the objects, with students rarely requesting additional parts or adjustments to the initial ones. The polystyrene pieces were primarily connected by thin wooden sticks of varying lengths, and to some extent by gluing, although gluing was not originally encouraged in the exercise description. After another hour and a half of work, at the end of the sessions, the teams conducted oral presentations about their work to practice their communication skills. Each team presented their work in an environment free of inhibitions, after which each team had to name their own work and the works of the other four groups.

Each workshop concluded with a photo session that highlighted the various ways surfaces and volumes appeared based on the position, intensity, and color of the light source. For this purpose, white and red-colored lights were used.

## 5 OBSERVATIONS DURING THE WORK

After the assignment was released, most participants engaged in group discussions. A few small sketches were created, and participants were hesitant to discuss them with the instructors. This hesitation might have been due to difficulties in distinguishing presentation drawings from preliminary sketches.

Since instructors handled the fabrication of component parts, the participant groups were asked to provide a list of the required parts' numbers and dimensions. Attention to detail in these lists varied, with only a few instances of omitting necessary components. In a single case, a significantly larger quantity of components was requested compared to what was needed, possibly due to estimations without calculations.

In several situations, team members omitted specifying units of measurement (cm or mm) when describing the parts needed. In one case, there was confusion as dimensions were expressed in both mm and cm. This issue was quickly resolved when brought to their attention.

Tolerances in part dimensions and potential error propagation when assembling a larger number of parts were not considered. The projects were based on ideal models. To prevent execution problems, given the limited exercise time, instructors emphasized this aspect and cut the pieces in a way that allowed for small adjustments during assembly.

A small number of teams requested spare parts before commencing construction. From a formal perspective, most works primarily used straight prisms. Only one team used pyramids but encountered difficulties in defining the face angles to achieve the desired pyramid height. Another team attempted to use pieces with compound angle cuts but, after struggling to define the necessary angles, decided to modify the solution and adopt pieces with simpler geometry. High school students lack experience in using 3D modeling programs. When digital tools are employed, there's a tendency to adapt to solutions readily offered by the modeling software [5]. This tendency was observed even when interacting with tools different from those known to the students. When the need arose to define parts with complex cutting angles, some students abandoned the complex shapes in favor of simpler ones, like straight prisms, which were more intuitive.

## 6 ANALYSIS OF THE RESULTS

Out of the total of 10 teams, the preferences for specific forms were as follows: cubes only - 1 group; rectangular prisms only - 1 group; a mixture of rectangular prisms and cubes - 4 groups; prisms with a triangular section - 3 groups; pyramids - 1 group. This indicates a general preference for prismatic shapes over angled ones in 2 or more directions, possibly due to the difficulty of generating the latter. Additionally, there's a ratio of 3/2 in favor of rectangular shapes over triangular ones. No significant differences were found regarding the preferences of groups from different sessions for separate formal categories.

The workshops resulted in 10 works, with 5 from

each session. During their presentation, the groups were asked to name the works based on what the resulting image suggested to the viewer. Both the authors and the other groups assigned names to the objects created during the workshop.

In the first session on June 9, Team 1.R named their work "Ice," while the other four groups chose names such as "Little Cube," "Meteorite," "Little Cube," and "Distortion." Group 1R (Fig. 1) used only cubes of variable sizes, mainly small with a few medium and large ones, in line with the fractal principle. They were the only group that created a plinth for their work.

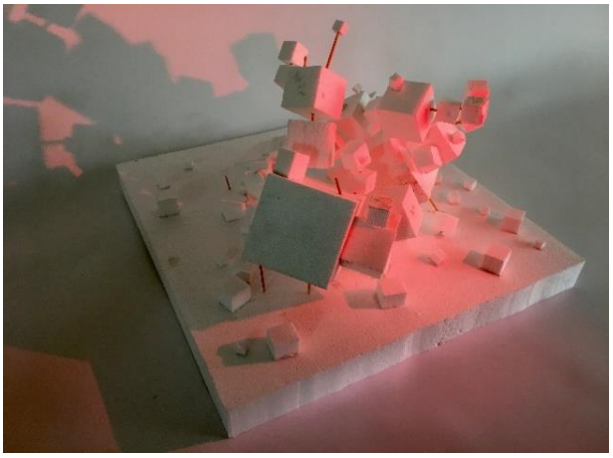

Fig. 1 Team 1R

Team 2.R named their work "Astral" (Fig. 2) while the other groups named it "Dolphin," "Snail," "Blown," and "Faucet." They used long, square, and equal prisms.

Fig. 2 Team 2R

Team 3.R selected "Sea Monster" (Fig. 3) while the other four groups went with names like "Horse Head," "Dragon," "Shatter," and "Shark." Exclusively triangular prisms were used in the creation of their work.

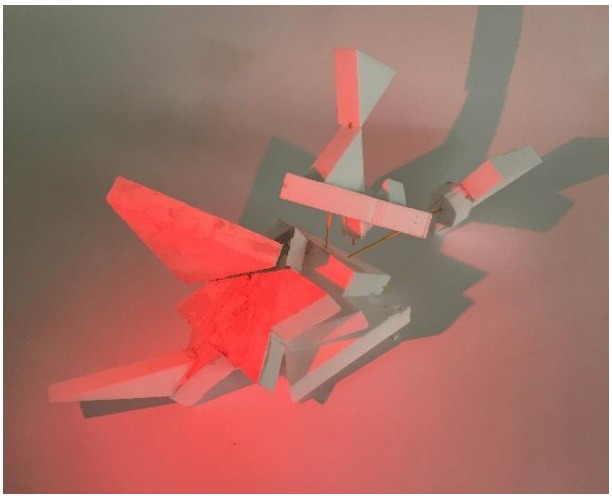

Fig. 3 Team 3R

Team 4.R used prisms and cubes to generate a closed perimeter space (Fig. 4), which they named "House." The other names chosen were "Matrix," "Obreja," "Temple," and "Labyrinth."

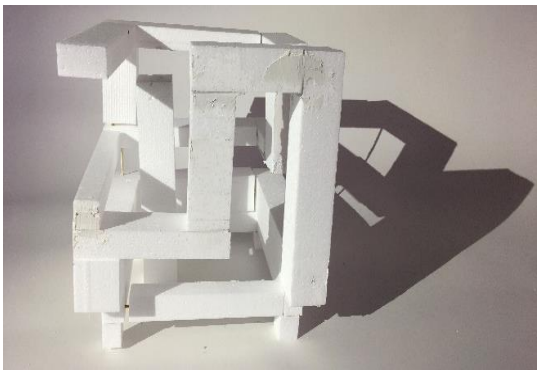

Fig. 4 Team 4R

"Supernova," created by Team 5.R, was made of triangular prisms and prompted the other groups to suggest names like "Surikan," "Sorcova" (Incantation Prop), "Fireworks," and "Superstar.

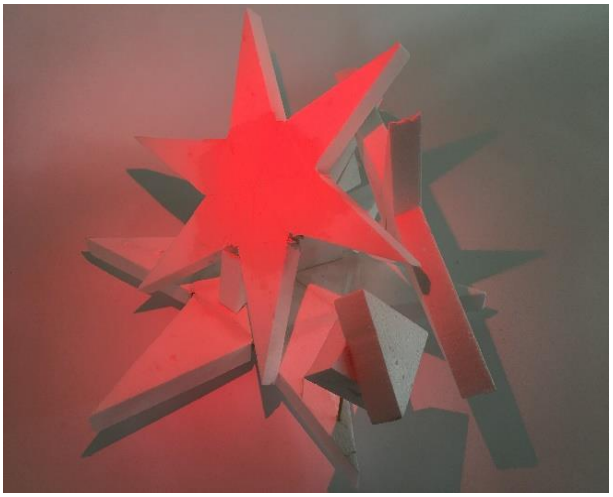

Fig. 5 Team 5R

The second session on June 16 also resulted in five group works.

Team 1BM named their work "Organized Chaos," while the other teams chose names like "Christmas Tree," "The Tower," "The Geometric Coral," and "Cloudy." They used cubes and small rectangular prisms.

Fig. 6 Team 1BM

Team 2BM selected "Pyrite," while the other options included "Mars," "Stardust," "Gigaultramegatool," and "Beautiful Chaos." This team used cubes and rectangular prisms of varying sizes.

Fig. 7 Team 2BM

Team 3BM created "The Skeleton" using flat, horizontally organized, triangular prisms. Other names included "Fossil," "Skewer," "DNA," and again, "Skeleton."

Fig. 8 Team 3BM

Team 4BM went with "The Intergalactic Flower," while the others chose names like "Megatron," "The Arrow," "Fir Tree," and "Alien." They used pointed pyramids, organized vertically.

Fig. 9 Team 4BM

Fig. 10 Team 5BM

Using prisms of square section and cubes, Team 5BM named their work "Hi5," while the other options were "Rollercoaster," "Popcorn," "Geometry Dash," and "Omitrix." The entire model-making process aimed to enhance participants' creativity and develop creative-based skills and abilities. Additionally, creating the models and naming them based on the received image contributed to an improved ability to perceive and understand abstract three-dimensional objects.

It's interesting to note that, despite differences in the students' levels of preparation between the two high schools, both sessions resulted in similar outcomes in terms of formal complexity for each session. Students from high schools where teachers implemented more thorough methods produced works with a high level of coherence and accuracy, but the results were somewhat uniform. In contrast, students from other high schools provided significantly different responses to the topic, likely due to the absence of a pre-learned "recipe." The student groups were not graded or ranked for their work. FAUT coordinators assessed various aspects, including composition complexity, adherence to the assignment, the ability to generate a concept and translate it into the work, technique, and execution accuracy. These criteria were stated at the beginning of the workshop.

Each student received a file containing photos of all the works completed that day. This allowed them to compare the quality of their own work with that of their peers and facilitated evaluation by the high school teacher who attended the workshop, as well as potentially by other specialized teachers from their school of origin.

## 7 LIMITATIONS. IMPROVEMENT PROPOSALS

The rectangular shape of the polystyrene plates and the cutting support of the device with a straight incandescent wire guided the works towards geometric shapes with straight edges. None of the teams used curved shapes. This formal limitation can be addressed in the future by introducing cutting devices with flexible incandescent wire, such as the Proxxon Micromot Thermocut 12/E, when resuming the exercise.

The standard size of the polystyrene board, especially with a thickness of 5 cm, led some groups to create prisms with this height or section, limiting the variety of shapes and sizes. However, there were numerous smaller shapes and different configurations. It's important to note that cutting shapes with inclined surfaces, such as tetrahedrons, pyramids, and other polyhedra, takes significantly more time. This led to a reduction in the variety and complexity of the basic shapes. To address this, in the future, we can extend the working time, increase the number of teaching staff performing cuts, or provide training in quickly cutting shapes with non-rectangular angles.

## 8 CONCLUSIONS

Through collaboration within and between the groups of students, as well as with the coordinating teaching staff, all the groups that participated in the two workshop sessions organized within the Maker@ARChA project managed to create interesting works, which were mostly in compliance with the assignment requirements. Surprisingly, certain similarities could be detected between works developed in different sessions, indicating a high level of originality.

The understanding demonstrated by the application of the principles of formal fractals and articulation in structuring the works enriched the knowledge of the students from the two art high schools. The exercise succeeded in generating their interest in fundamental university-level concepts, even though the manner of creating the works was entirely analog. There is a certain allure of figurative expression, as evidenced by some groups giving the same names to different works. This is unlikely to have been intentional; rather, it may have arisen organically as the work progressed. The need to assign names to the works towards the end of the process somewhat restrained the inclination towards figurative representation. Furthermore, the commendations offered by the coordinating teachers for works devoid of figurative elements redirected the students' focus towards the significance of abstract art, a concept less familiar to both the students and the general public. In doing so, it also drew attention to the realms of modern and contemporary architecture.

Diploma projects that used models in the final examination at our faculty have been positively evaluated every year. Creating analog models can serve as an alternative for students who are less skilled in digital modeling. The practice of crafting models, although significantly diminished due to the prevalence of computerized three-dimensional simulations, remains a valid method in artistic, architectural, and design faculties and high schools, as well as in the subsequent practice of the profession. Analog models have an increased capacity to suggest to the viewer.

Starting from the next year, the FAUT teaching staff intends to make it mandatory to create models in an analog or mixed manner within the architecture diploma projects.

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# Architecture Workshop Design Courses
# Conclusions from the First Years of Participation as an External Collaborator

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## ABSTRACT

In 2019, I had my first contact with the university as an associate lecturer during the design classes at the Faculty of Architecture and Urbanism in Timisoara. This opportunity ran parallel to my work in my own architectural office but addressed the need for communication and the transmission of knowledge I had accumulated over the years in the field of architectural design.
Alongside the hours allocated for Computer-Aided Design (CAD), I had the pleasure of being part of the Year 4 team for a semester. Later on, I became a member of the Year 2 team in the design studio, which is a fundamental part of the architecture curriculum.
Architecture can be taught as a subject by combining theoretical knowledge with practical insights beyond the confines of the classroom. In this regard, the design studio forms the core of training the next generation of architects. The main objective of the time dedicated to this subject is to foster a close student-instructor relationship where the theoretical knowledge acquired in lectures and seminars, combined with insights from real architectural projects, is gathered, understood, and concretely applied by students in the form of design projects. It is essentially where information transforms into something tangible: the essence of the design process.
The second year of the program at the faculty is dedicated to housing design. Generally, it involves the study of single-family housing or housing in small communities of 3 to 5 apartments, or in co-living/co-housing systems. The teaching methods that lead to the creation of a second-year project can be categorized into three main areas: research, the creative process, and project representation.
In brief, the design studio begins with the study of the design theme, followed by the analysis of the proposed urban context, the examination of similar architectural program examples, and the synthesis of the information gathered during the courses. The creative process involves implementing the conclusions from the initial research phase, followed by the development of architectural solutions in the actual project. The entire process includes sketches, working on floor plans, studying physical and digital models, all discussed within the teacher-student team, supported by theoretical and aesthetic arguments. Beyond acquiring knowledge, the culmination of the design studio lies in a student's ability to perform independently. The creative process can only be realized when a student can produce a coherent project, both aesthetically and functionally, without the guidance of a teacher. This achievement is evaluated through the final semester project, essentially an exam that validates or disproves a student's ability to synthesize the information received, engage in free, critical, and creative thinking, and, inherently, whether the teacher-student collaboration has been successful or not. It serves as the most valuable feedback for the structure of the design year.

**Keywords:** architecture, design, team, methods, housing

## 1 **Introduction** – Architectural design workshop

Complaints about the poor performance of architects and the declining quality of buildings have been common in the west since the Renaissance. They intensify at the end of the eighteenth century, when architectural education became institutionalized. The failures were blamed not only on the architects but on what was thought to be the poor quality of architectural education.[1]

Meaning in architecture is similarly complex, both profound and open ended. Such meaning is inevitably compounded by architecture's lengthy processes of production, by the vast array of individuals responsible for every stage of that production, by the final construction's relationships with its various contexts, by its interrelationships with other known elements of architectural expression, and by the unique pasts and presents of each individual who observes the final construction. Architecture is further complicated by the fact that each design is a testing ground for a number of associated concepts drawn from history, theory, technology, and even representation. [2]

The purpose of the second-year workshop within the Faculty of Architecture and Urbanism in Timisoara is to introduce students to the architecture program related to housing. For them, it represents the first steps into design, beyond the exercises they had in the first year—exercises primarily aimed at bridging the gap between high school and the architecture faculty. In this regard, the second-year period holds special significance, marking the beginning of the complex design process and the realization of the initial goals to be achieved in the creative process.

### 1.1 **Purpose**

The first objective is the ability to synthesize and implement the information and principles acquired during the courses and through corrections made by the teaching staff associated with the group. Alongside the assigned design theme, students crystallize their ideas through a series of small steps, resulting in individual or semi-collective housing projects, potentially incorporating functions compatible with living.

Efficiency in design represents another proposed objective. Generally, students in the field of architecture exhibit a profound passion for the creative aspect, sometimes completely disregarding an efficient approach to managing time, effort, and available resources. Therefore, it is the duty of the teaching staff to establish mechanisms for optimizing the invested effort.

Awareness of the work put in will foster an extremely important habit for what lies ahead after completing the faculty and embarking on a career in architecture, as future architects will be conscious of the value of the effort they put forth.

Beyond theoretical study, students should be exposed to real-life scenarios. Professional experience places us in a position to address issues that may arise and cannot be adequately explained during regular class hours. Whether we are specifically discussing interactions with various authorities or issues arising in relationships with clients or collaborators, or, in the latter case, issues emerging on construction sites, students need to be exposed to all these elements. In this regard, the Faculty organizes site visits and various presentations by third parties involved in the AEC industry to the extent possible.

Last but not least, one of the crucial points on the architectural agenda is sustainability, representing a universally valid and highly relevant element that must be addressed. Buildings are one of the cornerstones for creating a conducive living environment.

## 2 **Creative proces**

The most appropriate model for each teaching and learning strategy, including a set of the three main pillars, is then identified for each design phase. A practical strategy for managing design studios is also determined. Therefore mentioned three pillars are as follows : teaching and learning methods , assigned tasks or study aspects, and design communication techniques. [3]

From the primitive hut to the soaring skyscraper, architecture seeks to solve problems in three dimensions. It combines scientific analysis with poetic interpretation, using technology and order to create aesthetic impact and functionality. It transforms the ordinary and the mundane by

giving order, scale and rhythm to space. Renzo Piano described it as the most public and socially dangerous art: we can switch off the television or close a book, but we cannot ignore our built environment. [4]

### 2.1 Methods

Specifically, design methods can be divided into two components: the applied one and the one related to the synergy of the involved parties. The applied method, in turn, encompasses several domains that are gradually applied in a logical sequence. It starts with a research phase, from which certain conclusions are drawn. Then, it proceeds to sketching initial solutions, using the initial conclusions as a basis. Finally, the project is presented under the best conditions to gain support and, ultimately, to be evaluated.

### 2.2 The research

#### 2.21 Site Analysis

Upon receiving the design assignment, which includes a location and information related to that location, the analysis process begins. Generally, the analysis methods receive guidance from macro to micro and encompass all subjects involved in parameters that can influence the design process. Whether we are talking about urban parameters (such as land occupancy percentage or the typology of nearby housing, urban granularity, or setback requirements), the level of detail in the vicinity (housing typologies in the area, construction details in the area, proportions of voids, specific architectural language elements), orientation elements (cardinal points, major circulation routes, landmarks in the neighborhood), or elements of the context and the surrounding environment (specific flora and fauna, significant trees nearby or on the site, the degree of greenery in the area), all of these lead to a compilation of characteristics and the articulation of certain conclusions, with which the student may or may not operate in future projects. The necessary data for analysis are collected during the site visit as well.

#### 2.22 Study of Examples / References

Another category represents the study of various examples of architectural programs, a study that involves understanding the processes through which certain high-quality projects have been realized. Relationships with neighboring areas, the interior-exterior duality, and the coherence of interior spaces are a few examples in this regard.

#### 2.23 Synthesizing Accumulated Information

Beyond the site-related research, an important aspect is the structuring of information accumulated in various courses and seminars, concurrent with the search for additional information from manuals specific to the design process, regulations, guidelines, and current standards in effect.

### 2.3 Applied Part

Design Theme - serves as the initial support for any project. Normally, in client relationships, the design theme should be formulated in a way that allows the architect to understand the client's needs and any other relevant particulars that need to be included in the project. In the case of the design workshop, the theme is created by the teaching staff of the year, as there is no real client involved.

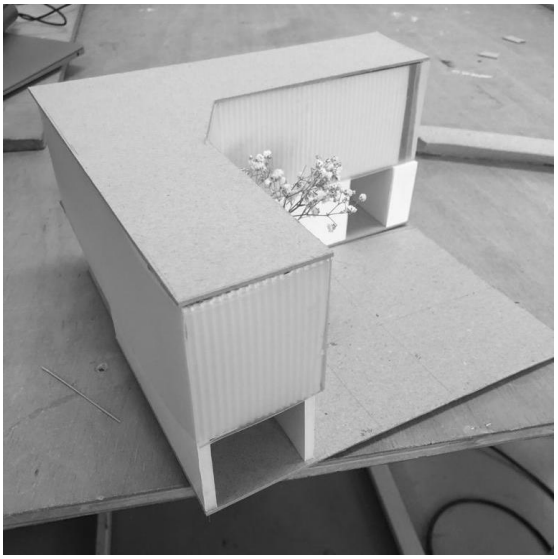
#### 2.31 Scenarios for Elaborating the Design Theme

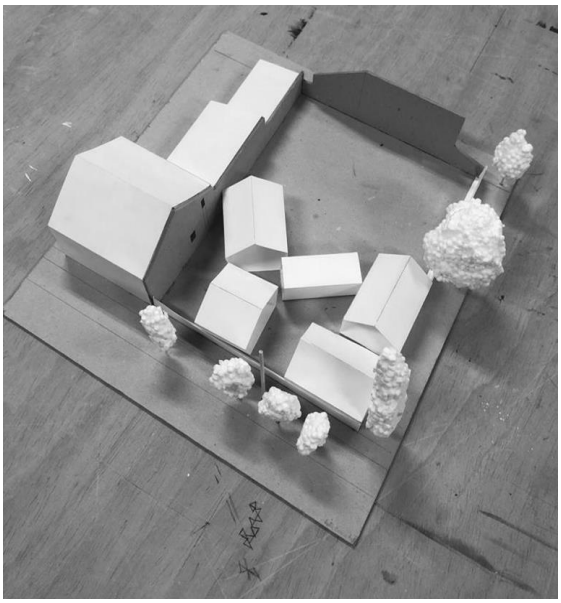
Although the design theme is given to the student, they are encouraged to supplement it with a living scenario. The theme can be extended with hypotheses that mention the occupant's occupations, hobbies, or other activities that could generate specific needs and, consequently, project features. Whether we are discussing a special place, a distinctive house configuration, or a particular atmosphere within the interior space, these scenarios can play a crucial role in shaping the project.

#### 2.32 Initial Explorations, Sketches, and Study Models

Particularly in the case of the initial attempts to materialize a project, working with study models made of easily accessible materials such as cardboard, clay, polystyrene, along with hand sketches, is encouraged. This is done in order to uncover and differentiate valid intentions from

less valid ones. This approach should also be considered in terms of streamlining the work process, as at this stage, the creative process is significantly aided by the presence of sketches and study models. It's worth noting that there is an ongoing debate concerning manual work versus computer-assisted work. Additionally, nowadays, the use of computer-aided tools such as AI may also come into play.
This issue should be seen more as an awareness of efficiency in using the three working methods, rather than as a subject of debate.
Example Models Created During Design Classes:



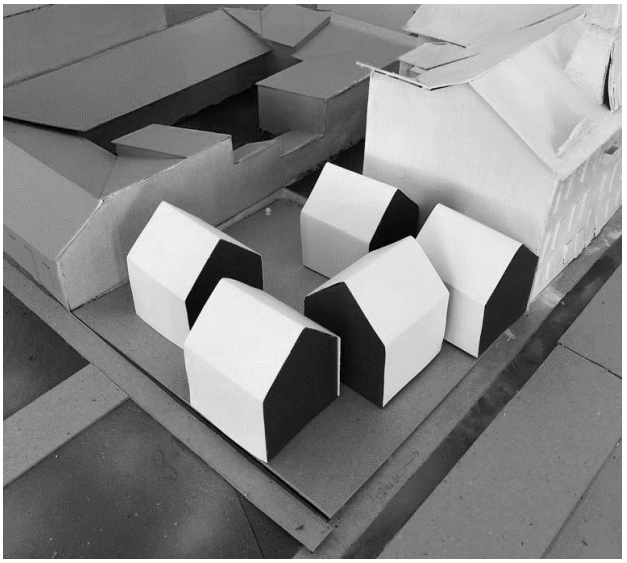


### 2.33 Method of Working with Alternatives

The creative process is an evolutionary one. Generally, multiple ideas are born, from which one emerges. This chosen idea undergoes further mutations and diversifies, repeating this process numerous times until the final version is reached. Some ideas evolve, while others come to a halt. However, it is possible that in a different context and under different circumstances, some of the discarded alternatives may gain subsequent validity. A characteristic of the creative process is its organic and vital essence. Furthermore, when there are two or more alternatives, there is a basis for comparison. Comparison reveals the strengths and weaknesses of a solution, ultimately guiding the author to make a decision, which, in a creative process, is certainly a truly useful tool.

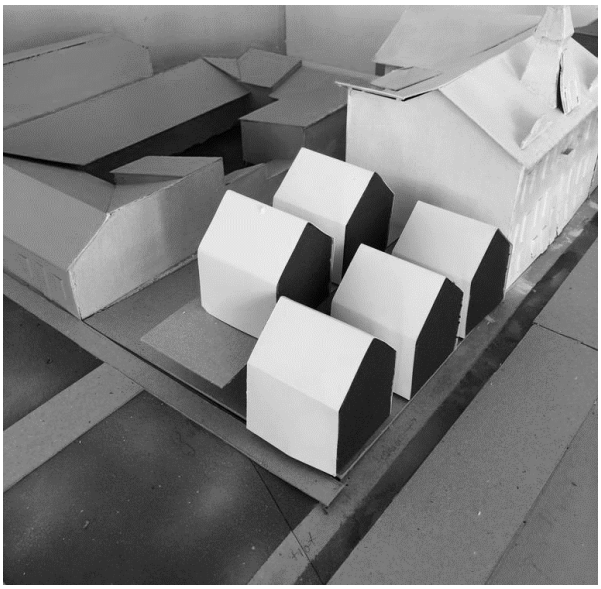
### 2.34 Idea Testing

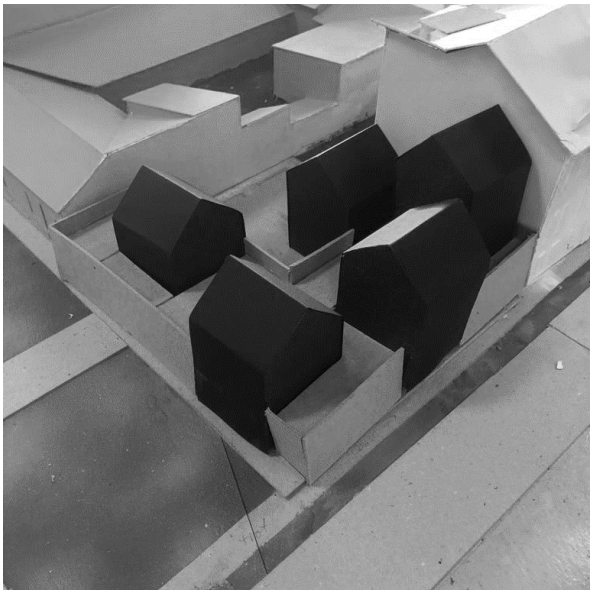
Another important aspect is the testing of certain ideas. In general, this aspect refers to the detailed examination of specific areas, whether it is about a construction element (facade, staircase, etc.) or materiality and the interaction with light or sound. Certain ideas are worth testing, even if only to find a response, whether positive or negative. Often, some ideas may not receive immediate feedback from tutors because they are outside the context. In such cases, a trial-and-error process can be beneficial and serve as a learning experience for both students and instructors.
Example of process evolution on study models:



### 2.35 Introduction of Concepts / Sustainability

Environmental issues are very important in the current context. Therefore, alongside the subjects that emphasize this aspect, it is necessary to highlight this in the design learning process. Whether it's about materials, the impact of the AEC (Architecture, Engineering, and Construction) industry on maintaining a carbon footprint balance, students need to be aware of environmentally friendly solutions and try to incorporate them into the creative process.





### 2.36 Solution Coagulation

The conclusion of the design phase is realized once as many conclusions from the research and creative process as possible are fulfilled. Generally, to streamline the design, this stage is computer-assisted for a more explicit processing of the components required by the design theme.

## 2.4 The Synergy Aspect

Beyond the applied aspect, the chemistry that forms between the involved parties has a significant impact. Whether it's the professional relationship between professors and students or the relationship among members of a team consisting of multiple students, this factor needs to be supported because architecture is a profession that involves teamwork.

### 2.41 Teamwork

Architectural design, in general, relies on teamwork. Architectural firms often have teams of several architects who collaborate with entities in related fields. For this reason, developing teamwork skills is paramount. However, in this profession, a critical creative factor comes into play: creative ego. Architects are, by definition, strong individual personalities. This can sometimes be a destructive aspect when working in a team, as the debate of ideas can strain collaboration. In these conditions, the negotiation of solutions for the benefit of the project, rather than fracturing the project team, becomes very important.

### 2.42 Multidisciplinarity

The AEC industry, in addition to architecture, involves many other fields. Within the Faculty of Construction at Polytechnic Timisoara, there are related specialties, whether they are civil engineers, building services engineers, surveyors, geotechnical engineers, or road engineers. A good interconnection between all these professions during the student years would only enhance the information processed by the students.

### 2.43 Architecture Universities

Another beneficial development already happening is the connections with other architecture faculties. In this regard, throughout

the second semester of the academic year, there is the CASA competition, aimed at faculties in the university centers of Romania. Recently, the competition has expanded its scope, inviting students from Debrecen (Hungary) and Novi Sad (Serbia) to participate. The major advantage of this initiative is the connection between faculties and the comparison of methods and workloads existing in other places. In this competition, students have the opportunity to interact not only with their peers from other faculties but, more importantly, with the perspectives of other instructors during a joint guidance session.

### 2.44 Extracurricular Events

Another factor that helps establish connections between professors and students is the university-organized trips or extracurricular events. Similar to team-building, these events aim to establish beneficial chemistry in subsequent studio relationships.

### 2.45 Encouraging Participation in Competitions and External Internships

Whether we are talking about competitions or external internships, voluntary or not, it is very important to involve students in such activities where they come into contact with external entities, administrations, and stakeholders in this profession. Moreover, they get to interact with various technologies and construction materials, especially during practical work on construction sites. This is extremely beneficial, and the Faculty of Architecture in Timisoara takes care of this by organizing practical internships at the end of each semester.

### 2.5 Representation

The creative process in architecture is realized through drawings that will undergo a lengthy approval process and then serve as the basis for construction. In the university, this representation process constitutes the final act of a project within the design studio since there is no actual construction site. Therefore, a crucial aspect is the creation of these drawings.

### 2.51 Technology / Hand Drawing vs. Computer vs. AI

Until a couple of decades ago, the representation process was exclusively done manually. With technological advancements, the drawing process for various components, whether it's plans, sections, facades, or volumetric images, has started to be computer-assisted. This naturally leads to the hand drawing versus computer discussion. In recent practice, computer-assisted representation methods bring undeniable benefits to representation techniques, with technologies like BIM being able to generate all the necessary components from a well-crafted 3D model. Once again, it is more important than ever to prioritize efficiency between methods, using hand drawing where necessary (sketches, quick solution details) and using computers for technical drawings and volumetric imagery representation.

Recently, Artificial Intelligence (AI) technologies have become increasingly prevalent. This is a phenomenon that cannot be ignored and, in turn, creates a new debate, not only among architects. What do we do? Does AI take over our profession? Technology can be used as a tool to enhance the design process. I mentioned the creative process as an organic and evolving one. AI generators can

be used in this sense; currently, AI technology can produce variations of a model based on parameters entered by the architect, starting from a generated 3D object. This can be a means of checking the evolution of an idea.

These are directions that the Faculty of Architecture in Timisoara supports and which are validated by the data collected during the pandemic period when, due to the conditions, teaching was done through the internet. Generations forced by circumstances to work with computers have shown an improved level of productivity and achievements, which can be considered as a positive outcome of digital work.

### 2.52 Calendar

A crucial aspect in optimizing the workflow within design studios is the methodical and phased approach to the design process. It is generally a less appreciated custom in the architectural profession to work chaotically and primarily towards the end of the deadline. This practice has been happening since the student years. It is an unfavorable process in the long run, resulting in nights spent in front of the project, accumulating stress, and a lack of rest. In this context, the Faculty, through design studios, aims to establish a calendar in such a way that the design part is carefully supervised and guided towards a normal design and teamwork process, where applicable.

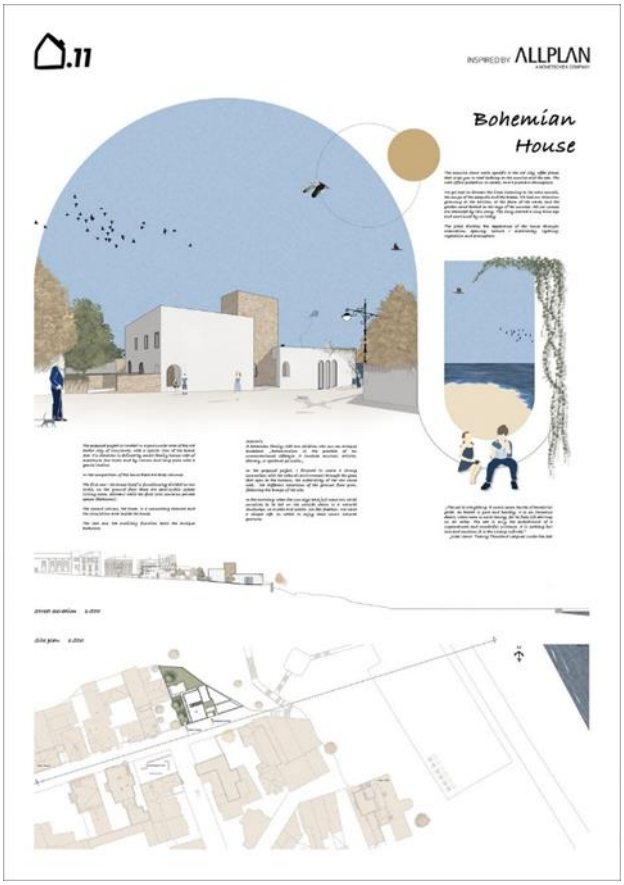
### 2.53 Corrections / Guidance

Another extremely important element is the correction sessions, either individual or group. The Faculty of Architecture and Urbanism uses this type of communication as an essential means of interaction between the teaching staff and students, being practically the most effective way of shaping ideas towards a high-quality solution. Based on a schedule established for each group, with a degree of freedom agreed upon, discussions are organized, supported by sketches and initial volumetric representations, then on technical drawings, either on paper or on a computer, whether using a laptop or a projector, so that the results of the correction session bring added value to the project and ultimately lead to a considerable evolution.

### 2.54 Presentations / Feedback

After the submission of final drawings, the process continues with project defense sessions, where the entire group participates. The session itself involves the student presenting the project and engaging in free discussions related to the strengths and weaknesses determined from the presentation and the examination of the drawings. Subsequently, the teaching staff provides feedback to each student individually, helping them understand the positive and negative aspects of the project.

Example of Final Drawings - Design Studio of the 2nd Year:


## 3 Conclusion

In architecture, a mutually robust relationship exists between education and profession. The qualities of architects and their works in a specific context profoundly depend on their education. Meanwhile, educational institutions continually seek to keep their programs up to date with advances and changes in the architectural profession. One of the approaches used to achieve this target is the inclusion of elective courses, which can flexibly address new or advanced topics and merge them in to a specific program to promote the being up-to-date of its graduates. [5]

Beyond the tangible elements and direct processes (discussions during mentoring sessions, modeling, presentations, feedback), the primary characteristic of the learning process, especially in the context of learning the design process, is the nurturing of the passion found in young students who have joined the faculty. Alongside creating a positive atmosphere and conveying information during classes and seminars, there is a unique spirit in architecture that surpasses the accumulated competencies, the level of involvement, and the requirements of the teaching staff.

While improvements can be made in the teaching process and technical resources can be acquired in line with the standards of emerging technologies, it is essential to preserve the spirit that exists within the school of architecture and transmit it further through design studio sessions.

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# Experience-based learning of construction basics for architecture students

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**ABSTRACT**
Teaching architecture students basic construction and structural engineering concepts is often challenging for educators. This is mainly caused by the fact that students find it difficult to visualise the taught principles and lose their motivation to stay engaged in the topic because of this.
The same struggle of architecture students was observed at the Faculty of Architecture and Urban Planning, where students have to engage with basic structural design concepts even from the first year. Teaching by textbook was insufficient, so different approaches had to be found and used to acquire construction basics more suitable and engaging for current students.
Therefore, two different approaches were used in other contexts. A trial-and-error approach was considered more suitable for first-year students since they could learn more from doing and experimenting with principles than memorising theoretical data. In this sense, using 1:10 scale model bricks, students were encouraged to explore different types of bond for a load bearing and a non load-bearing brick masonry wall and analyse structural and aesthetical features.
For second-year students, an experimentation approach was considered more suitable, in which students had to understand basic structural systems, slabs and wide-span structures by modelling and ultimately testing the scale models. Students had, therefore, the opportunity to design an aesthetically appealing structure, build the scale model, test its load-bearing capacity, and analyse its failure.
The paper presents the outline of both approaches, each exercise's objectives, advantages, and the struggles both educators and students went through during the assignments. It also analyses the obtained results regarding student activity reports and final examination results.

**Keywords:** basic construction concepts; alternative teaching methods; trial-and-error; experimentation; scale model analysis

## 1 INTRODUCTION

Within the Faculty of Architecture and Urban Planning of the Politehnica University of Timisoara, integrating construction-based knowledge in the education of architecture students is highly important. It helps them design various buildings while considering the used load-bearing materials and their structural behaviour.

Still, the motivation of architecture students in the early stages of their education to acquire knowledge concerning building materials and essential construction technologies and principles is a real challenge to educators.

Therefore, to increase the motivation of students to understand the taught concepts, alternative teaching methods had to be identified and used. Starting with the academic year 2022-2023, the Construction Basics two classes' practical activities, which were previously based on understanding structural systems based on case studies and drawn details, were reorganised. Instead of case-study-based learning, didactic game-based teaching was considered, using various models of taught building systems, which were later transformed into a competition between student groups.

According to studies, integrating modelling experiences in construction basics-related classes is necessary to engage students in the activity and ensure an active learning experience [1].

Students gain through this also critical thinking ability and problem-solving skills while also developing their communication skills and creativity [2].

## 2 TRIAL AND ERROR APPROACH

The trial-and-error approach was considered suitable for first year students since they are unfamiliar with basic construction principles and need to explore different building techniques. The approach focuses on learning something new by exploring different possibilities and experimenting with various strategies [3]. It is a valuable addition to theoretical learning since it helps transfer information from theory into practice [4].

### 2.1 Context

Since their architectural project was focused on designing a brick and timber structure, the exercise was meant to help them understand how brick load-bearing structures are built. More than this, it was meant to help them visualise various brick-laying patterns and see if they could be used as load-bearing or non-load-bearing structures.

For this exercise, 1:10 scale model bricks were used, and students were organised into 5-person groups to build and later analyse the created models.

The task was organised in two different steps:

- first, students were asked to build a wall using various laying patterns for the architectural design project (Fig. 1). Through this, students could identify the challenges of obtaining specific patterns and transforming pictures they had analysed into accurate scale models. At the same time, they could observe if a particular type of bond could be used as a load-bearing or just as a non-load-bearing structure. This was useful since students could not make this difference by only analysing projects and details. Subsequently, students were also asked to find a corner solution using the same pattern, an additional challenge they had to overcome.
- Secondly, as a final challenge, students were asked to build an arch using the available quantity of bricks, without using any mortar (Fig. 2). The primary purpose of the task was to bring forward that, in some instances, there is a need to use temporary support to build a load-bearing structure. Students got creative in this step, using all types of rounded objects they could find in the class. At the same time, it was also a way of teaching them how arches work since they had to apply a constant load at the top of the arch in order for it to maintain its stability.

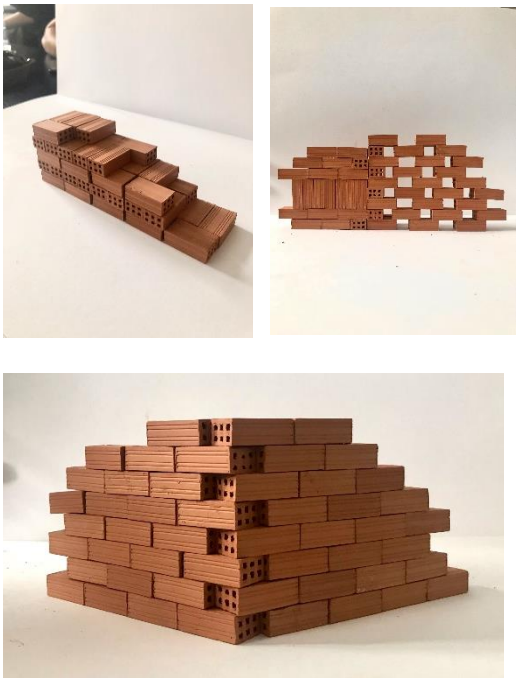

Fig. 1 Exploring different types of bonds for brick masonry structures – load-bearing solutions and aesthetic patterns

Fig. 2 Exploring the structural concepts behind the building of an arch

Both exercises were helpful from a pedagogical point of view since they enabled students to explore the diversity of masonry brick bonds and their versatility. At the same time, since most students initially focused on specific visual effects the brick bond could create, they could also explore how each brick must be placed to obtain the desired aesthetics. Students were not able to understand the link between structure and aesthetics by just analysing pictures and making hand drawings.

In the case of the second topic, only a few students eventually managed to build an arch. Interestingly, although they did not have any information concerning arch construction history and standard techniques at that moment, two groups of students built a Corbel arch by pure intuition. By discussing with these groups, they had no information about the corbel arches of Ancient Egypt or Mycenae.

The exercise proved to be a success with clear effect both in the architectural design class and ultimately in the basics of construction exam, where a similar, drawn exercise was given to the students.

## 3 EXPERIMENTAL APPROACH

The experimental approach was used during the second-year students' construction course, which approaches basic structural systems. The main scope of the exercises was to help students understand how different structural systems are built, how they behave when subjected to vertical loads and interpret their failure.

The activity was split into two exercises, the first focusing on reinforced concrete slabs and the second on long-span structures.

### 3.1.1 Exercise 1 – slab modelling

The first exercise had as a main topic the understanding of specific construction systems made of reinforced concrete suitable for horizontal load-bearing structures.

A hypothetical space of 6.00x6.00 m was thus considered above, and the students had to propose a slab. No additional vertical load-bearing element could be presented inside the space.

The exercise was done by four student groups, each group receiving from the start a specific type of concrete slab, which was subsequently calculated for the given span, 1:15 scale models built and ultimately tested. The following types of slabs were considered:

- One-way slabs on beams
- Two-way slabs on beams
- Ribbed slab
- Waffle slab
- Flat slabs

The reinforcement was done using 1mm wires for the scale models, and the concrete was replaced with modelling gypsum. The use of

modelling gypsum proved challenging for the students since a precise water-to-gypsum powder ratio had to be respected. Ultimately, the two groups failed to obtain a suitable consistency of the gypsum, and it was impossible to remove the slab from the mould even after two weeks (Fig. 3).

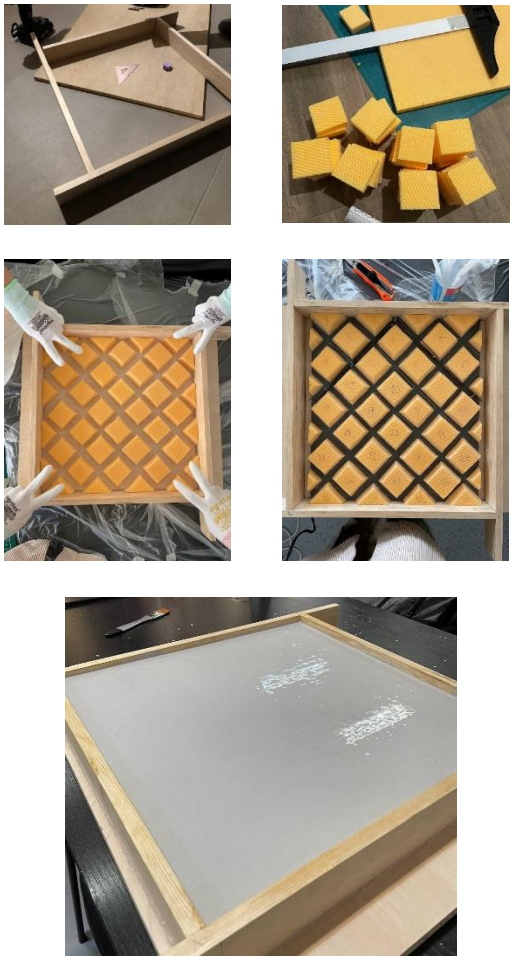

Fig. 3 Construction of the slab model

Due to the dimensions of the slabs, the scale models could not be tested in the laboratory with conventional testing gear. Instead, a 10x10 cm brick was laid in the middle of the slab above which 5, 10 and 15kg weights were placed, reaching 90kg. Most slabs did not fail under this load (Fig. 4, Fig. 5).

Fig. 4 Loading of the slab model

Fig. 5 Failure of the slab model

Students subsequently had to fill out a report in which they had to include a full description of the construction process materials used and provide an analysis of how their slab failed and what the cause could be (Fig. 6). They also had to include a critical analysis of the whole process, highlighting observed problems, how they could have been overcome and what the final effects on the model testing were.

The most interesting reports were the ones of students who did not manage to offer a slab for the final testing because they either did not use a proper recipe for the modelling gypsum or the slab broke before reaching the testing area due to poor or missing reinforcement and reduced thickness of the gypsum.

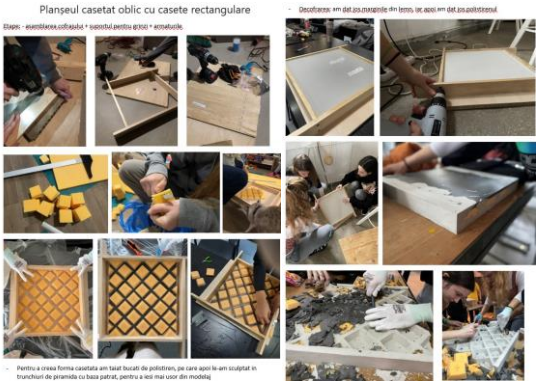


Fig. 6 Activity report

The exercise proved to be a real success, first from the students' perspective, who could better visualise all the different types of slabs and identify their aesthetic and structural differences. More than this, they saw first-hand how a slab is built and what challenges might occur during construction.

From the tutors' point of view, it was also a success since it became clear during the final semester exam that the students understood these structures and that they were no longer just drawing and pictures presented during the lectures.

Still, a series of problems were also identified throughout the exercise, which were addressed by the tutors for the new generation of second-year students:

- By assigning a specific type of slab to each group, the students just applied the indicated equations for the preliminary dimensioning of the slab and beams without further considering how the slab can be perceived by the inhabitant of the space and the aesthetical value of the structural element
- During the scale modelling, the moulds stuck to the gypsum, and it was difficult to separate them from the slab before the testing. One group applied some oil to the mould before pouring the gypsum in, which proved to be a pretty good solution.
- Reports were relatively brief and insufficiently described the whole process. Students proved not to be familiar with writing an activity report and performing a critical analysis of their work, so additional guidance has to be provided

Considering all this, the first exercise will be slightly changed for the academic year 2023-2024 while keeping the main idea. Students will have to model a slab of their choice by keeping in mind that it will be placed in the entrance area of an Architecture and Art Museum and should, therefore, create a suitable ambience. More than this, the span of the slab was increased to 10 meters, and the scale changed to 1:20, making the slab 50x50cm wide.

### 3.1.2 Exercise 2

The second exercise focused on understanding how a spatial beam works under vertical load.

Students were given a hypothetical volume for a bridge with an opening of 20 meters long and 4 meters wide, and they had to propose a coherent design that would support itself and a vertical load applied in the middle of the span. A 2m support area on each site was also taken into consideration. Students could use spaghetti as load-bearing elements to explore how a long-span structure made of highly brittle material would behave under vertical loads. The exercise is approached by different faculties worldwide with excellent results [1].

For the exercise, students were grouped into four-member teams, each designing their own structure and building scale models that were afterwards tested. The design had to be unique and ready to be tested. No additional information was provided except the theoretical ones explained during the lectures (Fig. 7).

For the scale models, students were allowed to use a maximum amount of 2 kg of spaghetti (far more than in other similar experiments which limit the use to 1kg or less) and hot glue for the joints which resulted in a very interesting challenge for the students due to the thickness of the elements and how to position them. Also, some of the teams complained that their spaghetti was getting soft due to applying to much heat from the glue gun.

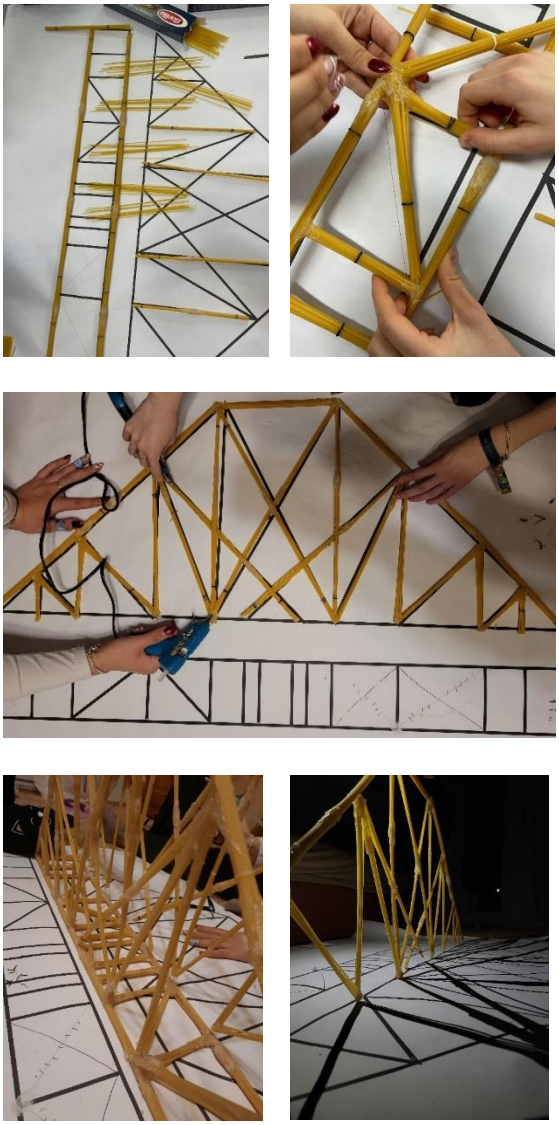

Fig. 7 Construction of the bridge

Similar to the previous exercise, given the dimensions of the models, they could not be tested in a laboratory a system made from rope and a scale was used to be able to identify how much load could be applied to the models (Fig. 8). For the supports two drawing tables were used. During the testing, almost all models failed under a surprisingly low load, proving the brittle behaviour of the used material. Still, students could observe the bending of the structure and had time to identify weaker elements/sections of their models.

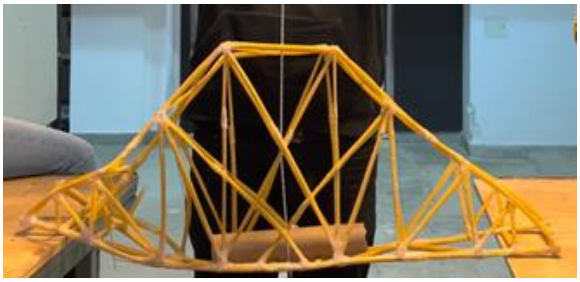

Fig. 8 Testing of the bridge

After the exercise, students were asked once again to fill out an activity report explaining why the specific structural system was chosen, describing the whole design and building process, and subsequently analysing the observed failure mechanisms (Fig. 9).

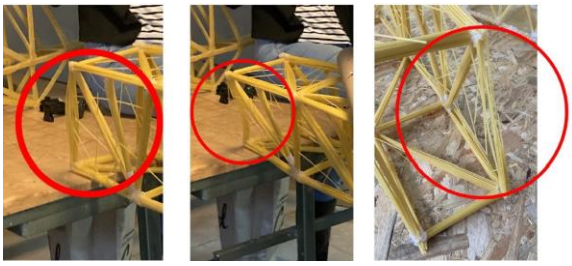

Fig. 9 Activity report – failure analysis

The exercise was a success because the students understood better how a long-span structure would behave under vertical loads and how the design process could lead to a stronger or weaker structure. They could also understand how different elements connect and how joints work in this type of structural element.
Although the exercise was a success, there were still some problems along the way:

- The fact that the design process was attributed entirely to the students, without any guidance, led to solutions based on internet-based studies, meaning that some teams tried just to copy a design found on the internet and not actually think about the real process. Since the exercise is used worldwide, studies and testing videos can be easily found online.
- During the testing, it was clear, even for the tutors, that the testing method is imperfect and could lead to small errors in correctly applying the vertical load. Due to these errors, some accidental

torsion was observed in a small group of models.

- The delivered reports were not very detailed and showed some lack of understanding of the process, but the models got through. The student seemed to be out of the comfort zone when using the correct terminology and unable to develop a critical thinking process about testing the models.

Considering this, like in the case of the previous exercise, things had to be improved for the upcoming academic year.

First, the brittle behaviour of the spaghetti elements had to be solved. More than an alternative material had to be found so students could glue the composing structural elements more easily.

Therefore, for the academic year 2023-2024, the used material was changed to paper straws, which should have a higher ductility and behave better during the bending of the structure. Since they are made of paper, they should also be easy to use during the modelling process. The number of straws will be limited to 250 since the quantity of pasta has proven to be too much. The span and width of the structure were not changed.

For the evaluation of the behaviour of the structure, this time, the weight-to-maximal load ratio will also be taken into account to encourage students to build not only structurally efficient load-bearing systems but also use less material.

## 4 CONCLUSIONS

Considering the students' conclusions from the reports and their subsequent class review, the exercise proved to have been a great success, which should be taken further in the following years.

More than this, during the first presentations of the exam, students were asked to design a slab and a roof structure with similar spans and explain why a specific structural solution was considered. Despite not quite remembering equations for the dimensioning of these structures, students were able to describe the process, identify what problems could arise by using the structural type they chose and explain its possible failure and cause. This proves that the exercise is a suitable teaching method and is helping architecture students better understand load-bearing structures and construction techniques.

## 5 ACKNOWLEDGMENTS

We would like to thank the students of the 2021-2027 generation for being part of these exercises and being so involved in the whole process.

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# Contemporary approaches in architectural education

# Creative education: teaching methodologies for urban design_UBGD examples

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**ABSTRACT**
Education in the 21st century is facing many challenges due to modern lifestyle, high levels of stress, data overflow and overall lack of attention among students. These issues were enhanced by the online education during the pandemic era, especially in the domain of Architecture. Architecture as a teaching field has a unique learning and research approaches based on the sensitive nature of artistic elements that requires unique techniques and everchanging curriculum. Aim of this paper is to present an overview of the specific set of methodology techniques used in the course: "Studio S06 U Urban regeneration of waterfront area" on the 4th year of Integrated Academic studies of Architecture (IASA) at the University of Belgrade, Faculty of Architecture (UBGD). In this course students are developing urban design projects while following the predefined methodology: (1) Creative Vision, (2) Superhero Method, (3) Brainwriting, (4) The image of the city (Kevin Lynch), (5) Space syntax scenario, (6) Lotus Blossom, and other analysis. Students were highly motivated and showed better overall results and exceptional teamwork when faced with the combination of aforementioned methods. This paper represents the possible benefits of creative education methodology that is one of the crucial preconditions for the future teaching of urban design that rely on creative thinking of students.

**Keywords:** education, creative thinking, teaching methodology, urban design, students, UBGD

## 1 INTRODUCTION

Ability to focus is an important skill learned from the early ages. Children undergo a set of creative exercises in order to develop the ability to focus attention. Creative education is a rather important topic in 21st century, due to overwhelming impact of modern, hectic lifestyle and usage of social media on education process [1,2]. There are certain studies regarding a serious lack of attention among students in the last decades [1]. It is said that today, on average, human attention span usually lasts for 8.25 second, which is shorter than the goldfishes [1,2,3]. According to different studies the duration of human attention span is reduced through generation, going from 12 seconds to 8 seconds for the population born between the 1995 and 2012 [1,2,4] These issues are often strongly connected with the increase in using technology and social media especially among the youngsters and current students. Quick access to variety of data has influenced the shorter attention spam among students in different areas of education, making the overall education process more challenging. In 2023 Artificial intelligence has quickly found its way into the education process and students are using different AI tools in order to complete the tasks more efficiently. Consequently, the students are relying more and more on technology. Also, modern way of life is proved to lead to increased levels of stress and therefore influence the already short attention span and contribute to learning challenges [1,3] All aforementioned issues were amplified during the pandemic. The COVID period represented one of the biggest issues considering the immediate change to online education which further decreased the student's attention and willingness to learn [4].

Today, teachers at all levels of education are facing serious issues regarding the educational processes and approaches. Variety of studies have shown that creativity in education can be a useful method and approach in decreasing the problems of modern education, from elementary school up to higher education systems [4,5]. However, there are certain conflicted opinions towards the connection between creativity and education in the science domain, due to a traditional and outdated approach of passive knowledge [6,7,8,9]. During the last two decades more and more different new teaching methodologies considering creative education were introduced [9,10,1,11,12].

In this paper we are focusing on the University level of education. Aim of this paper is to present an overview of the specific set of creative methodology techniques used in the course of urban design studio entitled: "*Studio S06 U Urban regeneration of waterfront area*" on the 4th year of Integrated Academic studies of Architecture (IASA) at the University of Belgrade, Faculty of Architecture (UBGD).

## 2 LEARNING METHODS IN URBAN DESIGN STUDIO

Maintaining attention of students has become a serious task for all the educational practice. This implies that approach to education, especially in architecture ought to be adaptable and resilient to transformations in order to preserve the same or higher level of quality [6,11]. Architecture as a teaching field has a unique learning and research approaches based on the creative, contextual and rather abstract design process that requires unique techniques and everchanging curriculum.

Overall concept of the course presented in this paper is focused on the urban design and urban planning, in the form of a design studio, with around 40 students each school year. Students are working in groups of four students throughout the whole semester. The learning and doing process of the course contains couple of steps starting from setting goals; site research and analyzing; identifying problems and potentials; outcome evaluation; up to planning and monitoring. These steps are in detail divided into three macro phases. In the first phase students are researching and analyzing the given location from different aspects and are generating ideas for the concept of revitalization and re-design of the given location. The subject area of the course is often in the small and medium cities of Serbia, and more precisely the students are dealing with the Riverfront area

and the city center, since these locations have a great potential for regeneration.

The second phase is mostly oriented towards urban planning, where students are proposing a detailed program of urban functions and spatial features, while the third and final phase is consisted of detailed drawing of urban design based on the initial idea and concept developed throughout the first phase. The overall results are on the line of creative urban design proposals. In this particular paper we are focusing on the first phase where specific and unique methodology for site analysis and concept was developed. The curriculum for the course was developed by the professor Aleksandra Djukic, and in the first phase it is consisted of the set of methods. Each method is specifically chosen with the aim of interactive involvement of students in order to focus their attention on the problem-solving approaches and creative thinking. This predefined methodology includes: (1) Creative Vision, (2) Superhero Method, (3) Brainwriting, (4) The image of the city (Kevin Lynch), (5) Space syntax scenario, (6) Lotus Blossom, and other supporting analysis. In the following text each of these methods will be explained with an example of students' graphical outcomes.

## 2.1 Creative vision

After being introduced with the overall idea of the course and with the specific course location, one of the first methods students are involved in is creating a *Creative vision.* The main idea of this method is for students to try and imagine what would the city that they are working on look like in 50 years. The task is to present their vision of the future city based on their first idea for the revitalization of the city. This method is quite challenging because it requires thinking "outside of the box", visualization and presentation of several city elements and features, such as main future functions in a city, spatial characteristics, heritage, nature, transportation and blue and green infrastructure, etc. The vision graphic should present the way people in the city are living, traveling, working and spending free time (see Fig. 1). Each group of students should create one poster depicting their unique vision of the city. In the Figure 1 the abstract version of Golubac in 2080 is presented, where one of the most distinguish city transformation is in the domain of spatial characteristics and aesthetics of residential architecture, and possibilities for developing the under-water living.


Fig. 1 "Vision for Golubac 2080", authors: Bešević, Kostić, Marković, Negovanović

## 2.2 Superhero Method

Superhero method is one of the brainstorming methods. The main goal is to choose one well-known character ("superhero" or "supervillain") and to imagine their thinking and feelings on a certain predefined problem in the city. Practically, to try and find a proper solution for the problem. This method can be arranged as a game with several players, where all of them try to solve an issue by taking the role of different superheroes and, finally, compare their solutions relating to their rationality or simplicity. This method is relatively simple. Nevertheless, it can be modified to be more complex with several steps. For this particular

course the method was transformed in order to fit the work in an urbanism related studio, and was adapted to involve an additional – middle step, where superhero or supervillain first choose exact superpowers and means to modify urban environment. One of the main goals of this method is to encourage students to take different characters so as to teach them a participation process in a smart way, and to think of a solution to rather rational, spatial problem with almost magical superpowers. Also, this is one of the most interesting methods for the students, and the results of this method are often very playful and colorful (see Fig.2 and Fig.3)


Fig. 2 Superhero Scarlet witch saving Golubac, authors: Miletić, Stanisavlić, Stevanović


Fig. 3 Superhero Grut saving Golubac, authors: Mitrović, Jovicic

## 2.3 Brainwriting

The brainwriting method is developed as an alternative to brainstorming method, to overcome its disadvantages. The main idea is to write thoughts and ideas down instead of partaking in oral discussion. This method was designed by German marketing expert Bernd Rohrbach in 1969. Main values are sharing ideas and thoughts in group environment and exchanging them.

The traditional brainwriting method usually has several steps. Its starts with identifying a problem, then each person in group writes their ideas and thoughts on paper, which is then passed to another person to check and expand them. This step can have several rounds. At the end, the whole group exchanges all written ideas jointly, while discussing all of the written elements. For teaching and learning in urban

design studios, it is important to include a 'spatial element' in brainwriting. This is done by not just writing ideas, but also drawing them as spatially-related measures and proposals. In addition, each participant proposes their own urban problems to be discussed and later put in a graphical manner (see Fig. 4) The goals of the "Urbanism-customized" Brainwriting Method are: to enable a creative joint discussion within group about important issues in spatial way; to create an atmosphere where everyone can rationally generate new ideas; to strengthen student ability to understand the positions and thoughts of other persons (city dwellers, users of public space); to allow all participants to share their ideas through different mediums, such oral explanation, drawing and/or writing and to understand the problems of other participants and, consequently, to be ready to give ideas and solutions on the problems on which you are not deeply familiar on.

## 2.4The image of the city (Kevin Lynch)

Method was developed by Prof. Aleksandra Djukić, based on the same-name book and research technique from 1960, authored by American urban theorist Kevin Lynch. It is based on the on-site research of the basic physical elements in a city to form the mental maps of this area. K. Lynch found that five such elements make the mental image of a certain city in human mind: paths, edges, districts, nodes, and landmarks. (see Fig. 5). The goals of this method are: to bring students closer to the importance of environmental psychology and environmental behavior for the identity of urban space and to show students how qualitative and psychologically-based data, such as human opinion and behavior, can be adequately collected, quantified, analyzed and utilized for urban design.


Fig. 4 Results of the Brainwriting methods for Sombor, authors: Gavrić, Mađarac, Stefanović, Radeč

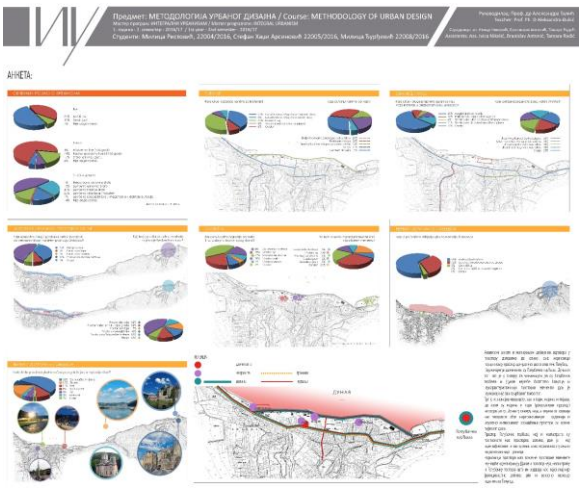


Fig. 5 Analysis of Golubac based on the Kevin Lynch theory, authors: Ristović, Đurđević, Hadži-Arsenović

## 2.5 Space syntax scenario

This is a method which analyses human behavior in a certain settlement area in a spatial way. It was developed by Bill Hillier and Julienne Hanson at the Bartlett School of the University College London in early 1980s. The simplest version of the method is to decompose the open urban space of a certain settlement or its part (urban quarter) into basic components – axes (streets) and nodes (crossroads). Then, users' flow is measured on each node in defined periods a day/week/year to collect their frequency. It is usually the number of pedestrians per hour on a certain node in urban matrix several times a week. This data is collected for all nodes in the targeted area to form so-called "axial maps" (see Fig.6)

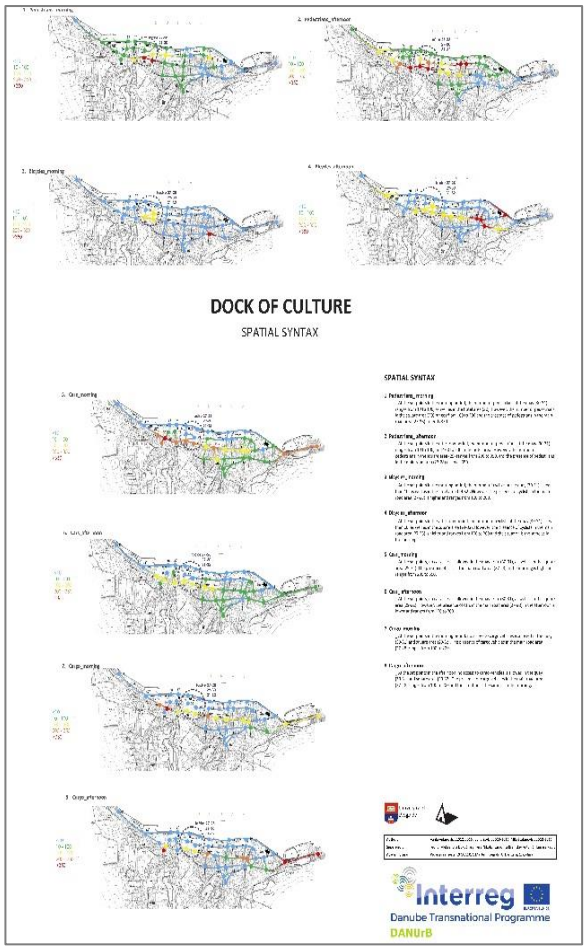


Fig. 6 Axial maps, authors: Savić, Vujanović, Stojanović

The "axial maps" of pedestrian, vehicle, cyclist flows are just the presentation of the current use of the open public space, so URBAN-SCENARIO PLANNING is introduced to properly address the data acquired by space syntax. Each of the students groups are required to measure the traffic and transportation flow in order to better understand the space usage of the selected area/location in a city. The data students gather through this method is crucial in their future development of the concept and urban design proposals.

## 2.6Lotus Blossom

The lotus blossom method is also a brainstorming technique that involves building different ideas around a central theme and then breaking them down into extensive sub-themes. The lotus diagram, also known as a map, consists of number of 3×3-square grids, with the main problem or potential in the middle of the square grid. This is one of the latest added methods to this course and is the last methods students are working on before presenting their final concepts for the selected location. This method requires deep knowledge and insight into the location problems and potentials. Additionally, it requires cross-connection of different topics and teamwork in the classroom. As a result, from this method the student groups are developing both analytical diagrams and spatial distributions of identified problems and potentials, as well as the proposed interventions (see Fig. 7 and Fig.8). After the implementation of all of the aforementioned methods students are ready to continue to the next phase and develop a unique concept idea, based on aforementioned extensive analysis and methods.

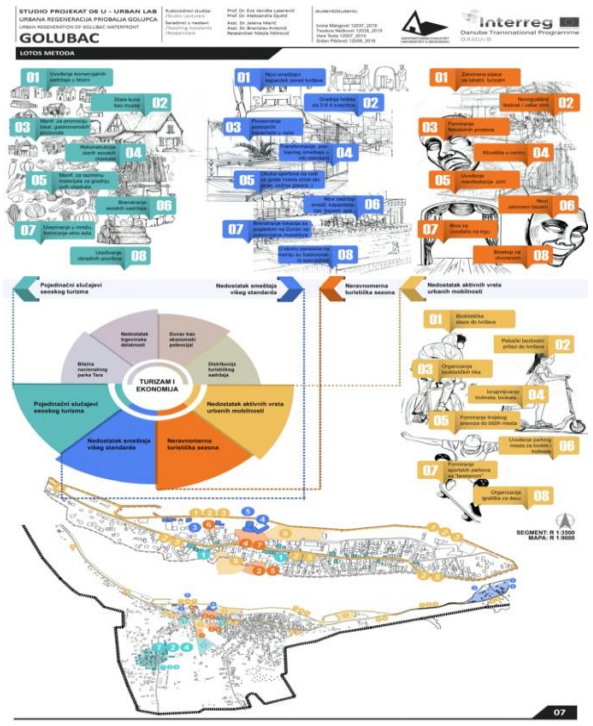


Fig. 7 Lotus Blossum method, authors: Bešević, Kostić, Negovanović, Marković

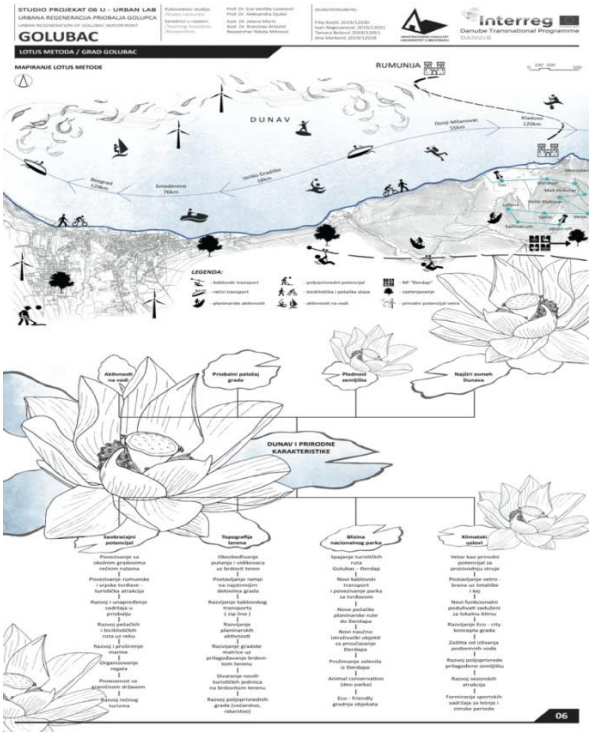


Fig. 8 Lotus Blossum method, authors: Bešević, Kostić, Negovanović, Marković

## 3 CONCLUSIONS

Last decade has marked the period of ICTs and social media strong influence on everyday life, our attention span and overall challenges in education process from elementary school up to university level. This is noticeable also in the field of architectural teaching. Maintaining attention of students has become a serious task for all the educational staff. One of the possible solutions to this issue is creative education and creative learning, that could be done through combination and variation of different methodologies in order to gather quality outcomes of students nowadays. This implies that approach to education, especially in architecture ought to be adaptable and resilient to transformations in order to preserve the same or higher level of quality. In this paper the unique set of methodologies as a part of an urban design studio was presented. These methods represent a combination and transformation of different well-known learning techniques, with the overall aim of more engaging and more creative ways for students to analyze the site location and develop quality concepts for urban planning and urban design proposals. This approach in the course "*Studio S06 U Urban regeneration of waterfront area*" on the 4th year IASA at UBGD resulted in more attention and involvement of students and better teamwork among the whole classroom and individual students groups. The outcomes presented for each of the aforementioned methods suggest that creative and dynamic methodology creates detailed and unique results.

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# Teaching complexity through organizing students' communications sessions (Applied Research and Urban Design discipline)

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**ABSTRACT**
The aim of the paper is to present, from an analytical perspective, the students' communications session organized within the activities of *Applied Research and Urban Design (ARUD)* discipline for the 4th year students in urban planning and landscape design from Ion Mincu's department of *Urban Planning and Territorial Development*.
The topic that was announced for 2022-2023 edition was centered on the **circular city concept** that is also the core concept for the *Circular City Challenge* research project (Urban Europe ERA-Net program) in which UAUIM is partner in an international consortium.
A comparative perspective on teaching methods is allowed by having two editions of ARUD communication sessions that are connected to research projects: the 2021 edition was based on *InClimate* international project within Erasmus program).
In the case of ARUD, the learning results are to be achieved through a frame in which points are given for presenting a paper in an online public event. The public presentation is prepared during the semester, with guidance from the teaching team, in order to be able to formulate an applied research question in connection to urban design principles and then to select and apply the methods for finding the answers (literature review, case-studies, interviews). Also, it is a discipline engaging students in current professional debates from participating in summer schools, workshops, editorial projects, etc.
Teaching about circularity or climate change in relation to urban design is an ambitious endeavor. The flexibility of this discipline that is focused on developing critical thinking through experiential learning is allowing students to explore complexity of content. Besides, it is an approach that is preparing students to increase their level of autonomy by building on transversal competences such as teamwork, communication, learning how to learn.

**Keywords** Communication session, experiential learning, complex concepts, circular city, climate resilience, current professional debates

## 1 LEARNING BY DOING: TEACHING THROUGH STUDENTS COMMUNICATION SESSIONS

Training to become both urban designer and architect means a lot of learning by doing. Specific literature on the pedagogy of studio work with students is already demonstrating the importance of experiential learning in relation to these professions.

Concerning urban design more specifically, the variety of approaches depends on the genesis of that particular teaching program, departments or schools organizing these programs now, and also the context for practicing this profession in one particular country. [1]

Learning through studio work is usually a simulation of reality that is not involving the risks of the real world but it attempts to create the conditions to explore real world practice. [2]

The most cited model when discussing learning theories is the Kolb model (concrete experience, reflective observation, abstract conceptualization, and active experimentation again in an iterative manner) [3] and although there are various interpretations of the Kolb's experiential learning cycle, the principles remain the same:

- learners should be active participants,
- knowledge is situated in relation to a context that is setting specific conditions of space and time,
- learners do get in touch with something that is new to them
- this novelty is bringing some level of risk taking since it is connected to real life issues,
- meaningful learning is helped by a critical reflection of the learning process itself [4]

Experiential learning in higher education is also based on Kolb model and although some scholars have argued that the concrete learning experience in higher education needs to have a degree of complexity that is not required in other settings of experiential learning, it is used to plan and structure learning in universities as well. Designing instructional models for higher education experiential learning is a recent concern. Radovics & al published in 2021 an article on both the theoretical foundations and practical guidelines for teaching with this approach at university level. [5]

And if frames for experiential learning are developed for the general content at bachelor level, limited scholarly focus has been given to the pedagogy of research. Hence, inspired by these reflections on the studio pedagogies in urban design, but also applying principles for achieving the benefits of experiential learning, this paper draws on the teaching experiences that were part of several editions of "learning by doing" when the challenge is to introduce students to applied research in relation to urban design.

The discipline entitled ***Applied Research and Urban Design - ARUP*** is part of the curriculum for the fourth year of both Urban Design and Planning and also Landscape Design and Planning bachelor degrees in Ion Mincu University of Architecture and Urban Planning. Since the very beginning, this discipline has been different from others since it allowed, for the two ECTS (European Credit Transfer System), the possibility of participating in events of various sorts or for publications including the ones organized by Ion Mincu University especially for this discipline. [1]

The general teaching objective of this discipline is to cultivate interest and involvement in the professional community by encouraging students to participate in competitions, workshops, communication sessions, conferences, seminars, and also, if possible to identify their interests for research at an early stage of their career.

A distinction has to be made between the objectives of the professional practice disciplines and those specific to this one because, unlike an internship in which students learn the current ways of working in private or public teams that are doing urban design, this discipline aims to connect students to reflection, synthesis or innovative initiatives that are not yet fully integrated in the current practice.

The discipline therefore aims at the ability to use, in professional practice of urban design, a variety

[1] This new approach was introduced in the curriculum as a way of giving flexibility to students to connect to the professional world outside the university but also to introduce a Student Communication Sessions or Workshops as part of their training encouraging students to present to the general public their interests and skills

of methods for documentation and analysis, as well as the knowledge and skills achieved through other disciplines already studied in the bachelor's program. These already achieved competences as well as the ones that are developed though this discipline refer not only to being able to propose content in practicing urban design profession, but also to communication and working in multidisciplinary teams – transversal competences that are of great importance for urban designers.

The events that are recognized with points on the basis of a specific table with the scoring grid[2] and these events can be organized both internally (by Ion Mincu University) but also by other higher education institutions, professional organizations or associations.

In time, a solid experience was accumulated within the teaching team not only for the recognition mechanism[3] but also for organizing specific opportunities as part of this discipline. In order to offer more visibility of results of students applied research approaches, the teaching staff[4] introduced the students' communication session on the basis of a call for presentations.

These calls for students' communication sessions have the advantage of being defined in close relationship to the teaching objectives. Applied research in urban design is understood as an approach that involves the ability to ask questions (applied research) about phenomena that have spatial manifestations that can be improved by design.

To participate in the communication session, students will be guided by the teaching team through several stages:

- formulating a research question within the given topic and that is adapted to the time frame and the already acquired competences of the students in the 4th year,
- evaluating the potential for multi-disciplinary approaches since this call is also welcoming students from other faculties in Ion Mincu or from other universities (Ion Mincu students get bonus points if they succeed in forming teams with students from other programs and universities),
- identifying the sources of information in order to correctly and completely define the basic terms for the study of those phenomena (from the literature),
- documenting and presenting examples that have worked elsewhere to improve similar situations that have faced the same type of phenomena (one case study relevant to the chosen subject)
-synthesizing some conclusions in answer to the research questions and in the form of action recommendations that can guide the urban design approach in spaces that face the analyzed phenomenon (the chosen subject is reflected I that space).

By practicing and being aware of the stages of this research approach applied to a subject chosen by students, they will increase their autonomy, as well as the skills of synthesis and presentation in an imposed format. These skills are useful in preparing the bachelor diploma project.

Besides, the communication sessions became more accessible to the general public. Due to the teaching conditions during the Pandemic, the teaching team decided to organize online presentations and the popularity prize for the student's presentations is given on the basis of an online survey (see Fig. 1) in which the public is asked to select their preferred team and to give

[2] the initial scoring grid allocated for involvement in events and publications was divided on chapters such as: scientific activities, exhibitions, workshops, competitions, publications

[3] The credits related to the discipline are now obtained based on the cumulation of points related to the eligible activities that are divided into two sections: the first section of the grid is requiring either preparation and presentation in the Communications Session or participation in workshops, competitions, professional events or publications for which the student had do give an intellectual input. The second half of the grid is with eligible activities of volunteering or listening to presentations in events that do not require content input. Both sections are to be demonstrated with a portfolio which must include evidence of participation. activities carried out specifying the professional benefits obtained, and also some results of that participation (content elements). The minimum score is 10 points corresponding to grade 5.

[4] The first editions of the workshops or communication sessions were organized by Gabriel Pascariu and Laura Tucan

also the reasons for their choice.

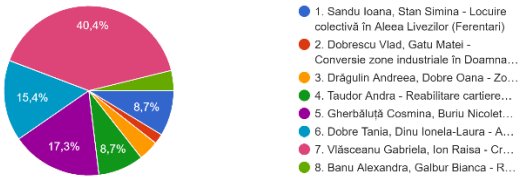


Fig. 2 online survey for the popularity prize from the public online event

For the same teaching objectives, in 2021/2022 and in 2022/2023, the methods that are applied within this discipline were designed around the topics of two research projects that were undergoing within the Urban Planning and Territorial Development Department.

## 2 TEACHING COMPLEXITY

### 2.1 Teaching about climate resilience

***InClimate***[5] - ***Integrating Climate Resilience in E.U. Higher Education*** was an Erasmus Plus project that was implemented in a partnership lead by the University of Salonic. The main topic was centered on introducing in the current curriculum more content on climate change both in terms of adaptation and mitigation.

Among the activities of this project, there were workshops with students that were introduced in connection or as part of several existing courses. The students were asked to define the concepts related to climate resilience with a specific mind mapping tool and after the international consortium has developed a common frame for defining the topic of climate resilience, the teaching team for ARUP has produced a reference that was more adapted to the teaching objectives of this discipline (see Fig 2).

The experiential learning of this discipline requires the students to define applied research questions that are relevant in connection to a given topic. Through these questions, one subject was defined by each team of students in relation to key-concepts that were presented as a conceptual map together with the call for presentations.

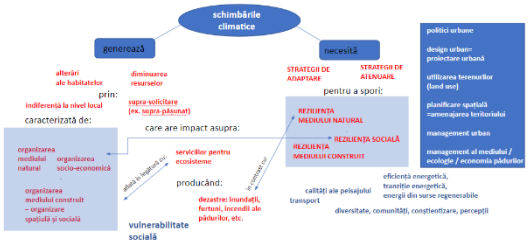


Fig. 2 referential frame for the relation between the topic of climate resilience and various subjects that are relevant to urban design for climate resilience

By requiring to focus on climate resilience topic, various subjects were selected by students:

-infrastructure for adapting the cities to flooding risks

-community gardens for resilient communities

-urban forests as green infrastructure for climate mitigation

-green roofs for housing – adapting to higher temperatures in cities

-spaces for recycling at in systems at regional level

-smart mobility urban infrastructure for carbon free cities

-energy efficiency in large housing ensembles

Each such subject from a team was then integrated in the referential frame for the topic of climate resilience (see figure 3 for the particular case of urban forests). The tendency in the students' approaches was to collect information from the abundant online sources on climate mitigation or adaptation that was not leading to a coherent result in terms of guiding principles for urban design. Hence, experiential learning meant to insist in building the capacity of students to keep their focus on the urban design principles that they have to identify in relation to that particular subject.

[5] https://inclimate.eu/ project financed within the Erasmus program - Cooperation for innovation and the exchange of good practices KA203 – strategic partnerships for higher education

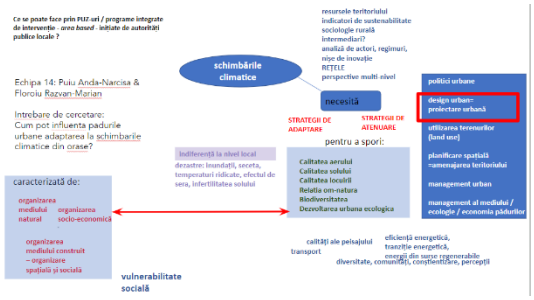


Fig. 3 an example of integration of a subject in the overall frame: urban design for urban forests

The content was very much depending on each team, but all these subjects were addressed with the same common structure of steps to be taken:

a. Formulating the applied research question
b. Defining key terms for that particular subject from literature review
c. Selecting a case study that is relevant for the chosen subject
d. Defining principles for urban design in places where the chosen subject needs to be addressed – as synthetic answers to the research question
e. Preparing a visual presentation with the results from each of the previous steps.

Although every team had to organize for each of these steps, for the literature review part, there was an indication that the students had to derive their understanding of the specific notions for their subject from some level of common overview of the climate resilience topic. Hence, the members of the teaching team who were also part of the Ion Mincu University team in the InClimate research project consortium suggested several bibliography references that were given to all teams.

The selection of these references was a real challenge because the intention was to focus already on publications that address professional interests from the urban designers' perspectives. The challenge is even more difficult because of language barriers but also because, at the bachelor level, students in architecture or urban design do not necessarily have previous requirements in their curriculum to read scientific papers from peer reviewed journals.

One common reference was taken from such journal (European Planning Studies) and the feedback received from students was that Mehmood text was hard to follow although it has an extensive introduction that is presenting the evolution of the resilience concept not only in the UK theoretical approaches but also in planning practices. [6] Another reference from the common list was taken from a journal that brings academic research towards professionals and it was based on the pragmatic analysis of several examples when Swedish municipalities developed adaptation plans for climatic extremes.[7] The main reason to select this article was that the standing point of the authors was to be helpful to practicing professionals especially to those who work within or for public administration. The table of possible measures in relation to hazards from various sectors (water and sanitation infrastructure, housing, transportation, urban regulations, environment and natural resources management) was considered by the teaching team for this discipline as an important tool to have urban design students considering the physical realities they will be working with in relation to climate adaptation needs.

## 2.2 Urban circularity teaching

Based on the previous edition of this discipline that allowed the exploration of the climate resilience concept from an ongoing research project in relation to an experiential learning method, the circularity within the urban environment was selected as topic for the call for students communication session for the 2022/2023 academic year.

The decision was influenced also by the fact that ***CircularCityChallenge***[6] is a research project that is implemented through ERA-Net Urban Europe Program[7]. Moreover, as demonstrated by the subtitle of this project – "Creating a Next Generation Participatory Contest for Young People to integrate Circularity in School Curricula", CircularCityChallenge is already focused on

[6] https://www.uauim.ro/en/research/circular-city-challenge/

[7] ERA-NET Cofund Urban Transformation Capacities call in which the project was selected is "Capacity for urban transformation for sustainability, resilience and increasing the quality of life in European cities."

capacity building for high school pupils to understand and explore potential ways to more circularity in their built environment.

One of the main objectives of this research project is precisely the definition of a circular city that will make sense to high schoolers. Based on this understanding of the circular city, young people will be asked to build scenarios or real demonstrations of circularity with stakeholders they already know or they meet during this process.

Similar to the previous edition, the teaching team connected urban design to the circular cities topic and they made available several scientific publications as a common reference for the literature review. The research-based book of Jo Williams [8] defines the circular city and circular development in relation to the spatial issues of a city and it goes from an economic concept towards planning and design for urban development that is aiming at circularity. Examples from four European cities (Amsterdam, London, Paris and Stockholm) are given and this was considered very important for ARUD teams who were also required to present a solid case study in relation to their subject. The other selected author, Elzbieta Rynska, has published a book that is connecting emerging research to opportunities for professionals to contribute to developing and designing circular cities. [9] Although this edition house from United States is not familiar to European researchers, the book was selected because it offers a solid perspective on how this abstract concept of circularity applies to cities and several case studies from Poland are presented. Also, this is one of the few publications that offers also an interesting perspective on how the concept of circular cities is to be considered in the brief that is given to a designer.

Based on the feedback from the previous edition, and also on the complaints of students about the extensive length of these two publications indicated for the second edition, the cover of the call (see figure 4) was already sending students to one of the main resources on this topic [10] for both the literature review and the case studies steps of the ARUD discipline. In comparison to the previous edition on climate resilience, the topic of circular cities was addressed in this publication, not as scientific literature that is difficult to use by bachelor students, but as so called "grey literature" that was put together through a program in which several contributors tried to forming a bridge between research and practice: Circle Lab for Cities Program[8]

This publication is not the only result of the applied research program – and the web platform that was generated [9] is based on a solid taxonomy (see Table 1) that was of great importance in the selection of the case studies for ARUD discipline

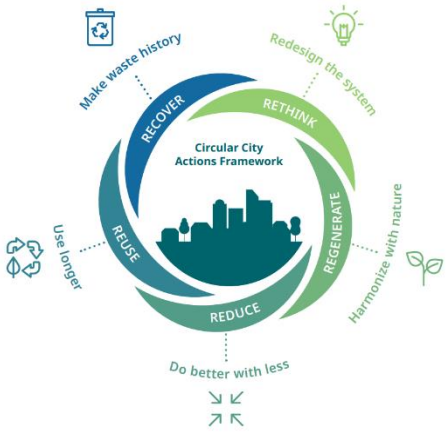


Fig. 4 the frame for understanding circular cities

Source: Explanatory material published by ICLEI – Local Governments for Sustainability within Circle Lab for Cities Program, page 4

The case study in the methodology of this discipline is to be selected with a special concern of finding answers to the research question in real situations in which, through urban design approaches, concrete results have been achieved. But the visible results are not the only elements of interest for a case-study. The students are required to go beyond the description of that case. Studying a case means also being able to understand how and why something happened. This analytical approach is defining the case study method that allows the understanding of the complexity of a real context.

[8] The partners of the Circle Lab for Cities are: ICLEI, Ellen Mac Arthur Foundation, Metabolic and Circle Economy. The program is funded by MAVA Foundation.

[9] https://knowledge-hub.circle-lab.com/cities

Table 1 – some of the aspects included in the taxonomy for examples of circularity in cities

Source: Circle Lab for Cities knowledge online hub

| VARIABLE | LIST OF CATEGORIES |
|---|---|
| Key elements of circular cities | -Prioritise regenerative resources,<br>-Stretch the lifetime<br>-Use waste as a resource<br>-Rethink the business model<br>-Design for the future<br>-Incorporate digital technology<br>-Team up to create joint value<br>-Strengthen and advance knowledge |
| Policies | inform, manage, regulate, incentivize, mobilise |
| **Actions frameworks**<br><br>RETHINK | -Eliminate linear incentives and set goals for circularity<br>-Support close loop systems and cross sectoral synergies<br>-Enable sustainable lifestyles |
| REGENERATE | -Protect and restore local ecosystems<br>-Promote solutions inspired and supported by nature<br>-Prioritise renewable resources |
| REDUCE | -Design infrastructure and built environment for resource efficiency<br>-Support circular business innovation<br>-Support local low impact economies |
| REUSE | -Design and regulate for extensive use<br>-Facilitate second-hand markets and sharing and exchange platforms<br>-supoort reuse, repair, remanufacturing, maintenance of products, spaces and infrastructure |
| RECOVER | -design and regulate for separation and recovery<br>-collect and sort waste to facilitate recovery<br>-process waste and ensure its re-entry into industry at its highest value |
| Thematic areas | Built environment<br>Energy systems<br>Food systems<br>Consumer goods<br>Water systems<br>Mobility systems |

The teams of students could apply the taxonomy also for the selection of examples that are connected to their chosen subject (research question). Although the presentations on the online knowledge hub is rather short, the ARUD students could develop them further as case-studies also because of this solid frame that was already ensuring this bridge between theoretical approach and the complexity of reality.

## 3 CONCLUSIONS FROM A COMPARATIVE PERSPECTIVE

Addressing circularity or climate change in relation to urban design is an ambitious endeavor. As demonstrated above, the flexibility of this discipline in terms of content but not in terms of method has allowed this learning by doing experience. The approach is structured not in the cognitive competences about climate resilience or circularity, but in the rigorous implementation of the stages for preparing the public presentation. Acquiring specific knowledge on a topic is a secondary objective The main aim is to develop critical thinking and autonomy through experiential learning. With this freedom, students are encouraged to explore complexity in terms of content.

Both editions have shown that bachelor degree students in urban design program are not willing or prepared to get invested in reading scientific literature of extensive lengths. One lesson for the teaching team was to select the references (even from grey literature) that are already on the operational side.

In both editions, the teaching team could notice that the students' documenting approach is based on searching for images of realities that seem to be connected to their chosen subject. But when guided to analyze processes and not just to describe results, the case study method, although more difficult, becomes obviously useful in answering the research question and in defining guiding principles for urban design.

This teaching experience was fruitful also in both editions for taking high level ambitions in research projects and making them more accessible to bachelor degree students. And although not many of the students became eager to read peer reviewed articles from scientific journals, there was an opening towards the benefits of applied research methods for preparing a good basis for urban design proposals.

## 4 ACKNOWLEDGMENTS

Although the author of the present article had the coordination of this discipline since the academic year of 2020/2021, special recognition is to be

given to Gabriel PASCARIU who created this flexible mechanism of ECTS from participating in various relevant events and introduced it in the curriculum.

Also, the teaching team for this discipline[10] is not only giving guidance for each step of the process for preparing the Student Communication presentation, but they are also doing extra-work for connecting this discipline to undergoing research projects and to organize the communication session. Hence, special appreciation has to be given to: Laura TUCAN, Eugen MARINESCU, Matei CHOCHECI, Dana MILEA.

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[10] presented as Practical Exercise (L) in the curriculum with one hour per week of direct teaching

# Heritage and water – workshops for children and architecture students

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**ABSTRACT**
Between 10 and 14 July 2023 the holiday workshops for children and young people "Heritage and Water" were held at the Faculty of Architecture and Urban Planning in Timisoara (FAUT), a project developed by De-a arhitectura Association (DAA) in collaboration with FAUT, Aquatim Foundation and the National Museum of Banat, a project that received financial support from the Alber Foundation by winning an educational project competition. This was an experimental project, bringing together 35 children between 8 and 13 years old and 36 FAUT students from the first, second and the third year of study, 8 trainers, 4 volunteers, 4 collaborators from different fields related to architecture, one photographer and De-a arhitectura Challenge team.
The main objective of the project was to bring children and students closer to the heritage objectives of Timisoara that are related to water, but also to exchange experiences and encourage collaboration between children, students and teachers of the FAUT, the supervising architects of De-a arhitectura Association, primary and secondary school teachers and other specialists of the built and natural environment (landscape architect, hydrologist, urban geographer, etc.).
Methodology: The students and children were split in four groups working at the three selected sites: one group at the Water Museum, one group at the National Museum of Banat - Theresia Bastion and two groups at the Bishops' Bridge. Every group was guided by two teachers and one or two volunteers; also student-child pairs were made within each group. During the five days the students and children tried to find the answers to some questions (What is a heritage building? How has the presence of water shaped the city's history and built heritage? What legacy do we leave to our descendants?) through guided tours, site analysis (field observations, photographs, survey), presentations made by other specialists and then they tried to imagine a future for each monument. The students helped the children during this period, based on the principle: you learn best when you teach others (according to Dale's cone of experience). On the last day there was the final presentation of the proposals materialized in 3D models, in which the participants in the project and the children's parents took part.
As a conclusion, it was a successful experiment that should be replicated annually, if possible. According to the feedbacks from the teachers, students, children and parents the project added value to all categories of participants. Some photos and the final presentation are available on De-a arhitectura channels: website, facebook, linkedIn.

**Keywords:** heritage, water, workshops, children, architecture students, experiment in education

## 1 INTRODUCTION

The project started from a few questions: what would it be like to learn together about heritage, about the city, about its values, about what defines it, about architecture: architects, students, children, parents? And what would it be like to do this in a playful and cooperative way? And because architects don't make decisions alone... how about getting to know some of the architects' collaborators? How do we learn from them? But can adults learn from children a different way of looking at the future? Can we learn from them to be more creative?

In order to have the financial support for the development of the project, DAA applied for a grant when Alber Foundation launched a competition for educational projects. Then the project implementation team was formed: four members of FAUT, four persons from DAA Association - architects and primary and secondary school teachers, four volunteers and four collaborators: an architect, a geographer specialized in hydrology, a literary critic, that is also a novelist and essayist and a landscape architect. Later on, De-a arhitectura Challenge team has joined. During the five days of workshops the students and children tried to find the answers to some questions (What is a heritage building? How has the presence of water shaped the city's history and built heritage? What legacy do we leave to our descendants?) through guided tours, site analysis (field observations, photographs, survey), presentations made by other specialists and then they tried to imagine a future for each monument.


Fig. 1 Historical monument (from [10])

## 2 ABOUT DE-A ARHITECTURA

### 2.1 Past and present

De-a Arhitectura was formed during 2011, when the six founding members came together to write the cultural programme application "De-a arhitectura - architecture and built environment education". The Association De-a Arhitectura was founded in January 2013, by the same team.

The mission of the NGO stated on the website [1] is: We build through education. Our construction grows when:

-children and adults understand and love the values of the built environment and are active in their communities:

-built environment professionals engage with society through education;

-in education, play, experimentation and creativity are taken seriously.

In 10 years according to the annual report DAA the program has reached more than 30.000 children in state schools in Romania from primary to high school and more than 1.000 teachers. Every year more than 3.500 pupils, 100 architects volunteers and 100 teachers are involved. [2] The uniqueness of the program lies in the fact that it is the only school program in Romania taught in a mixed team (teacher + specialist) and that it is based on project-based learning. [3]

### 2.2 Educating children and young people through architecture programs

Architecture is a profession that is connected to everything that surrounds us and therefore perhaps one of the most complex and best suited to educate the younger generation on respect for values, the natural and built environment, heritage, sustainability, the use of unconventional energies, etc. In the world there are too few projects developed on such a large scale that are aimed at education through architecture and that are included in the national curriculum.

There are, however, similar projects about which articles have been written [4-6]. Within the DAA some of the summer workshops (De-a arhitectura in my room [7], Petrila Planet [8]) involve an approach where architecture students work together with children of different ages. Heritage and Water is, in terms of the number of participants and the professional diversity of the people involved, one of the most extensive projects.

## 3 PROJECT PURPOSE, OBJECTIVES AND SELECTED SITES

### 3.1 The context; the need for this project

In the context of the return of the De-a arhitecura

responsible for the western part of the country as a full professor at FAUT, the team decided that a collaboration that started timidly a few years ago should materialize in a few projects involving all age groups. The link between heritage and water became a topic with the guided tours organized by team members in November 2022 through a project organized by UWT. It was also at that time that the team recognized the need for city residents of all ages to know more about this topic. If guided tours are a shortcut for adults, we think that a much better way for children and young people to learn is through summer schools. And the involvement of architects and architectural students in educating the community for these values is mandatory. Because in all projects concerning heritage and water an interdisciplinary team is involved, this aspect was important in the whole approach.

### 3.2 The aim of the project

Heritage buildings-historical, industrial or vernacular monuments, represent the "built heritage" inherited from our ancestors. Water is the natural element in the vicinity of which the first human settlements appeared and developed, but which, in its accidental or ordinary manifestations (such as rainwater), can also destroy them. What heritage buildings or ensembles can be found in your locality? What forms does water take in the built environment? What do heritage and water have in common? Why value and preserve the built and natural heritage of a locality? How can a heritage asset be adapted to the needs of its contemporaries? What legacy do we leave to our descendants? (Fig.1)

The aim of the project was to raise the awareness of pupils and students about the heritage sites of Timisoara and their relationship with water. The project also aimed at exchanging experience and encouraging collaboration between different age groups, on the one hand, and the teaching staff of the Faculty of Architecture and Urban Planning (FAUT), the supervising architects of the De-a arhitectura Association, teachers from pre-university education and other specialists of the built and natural environment (literary critics, geographers, landscape architects, etc.) on the other hand. The stake of the project, i.e. the mixed-age workshops for architectural education, was built on the premise that by capitalizing on the diverse educational experiences of teachers involved in the architecture programs on the one hand, and in the university environment on the other hand, it will be possible to generate a valuable educational experience that can be addressed to both secondary school students and students, with multiple learning benefits. The key question was: What would it be like to be able to learn together about architecture, and people big and small? (Fig.2)

### 3.3Specific objectives of the project

The specific objectives of the project were:

- to produce presentation materials adapted to children and young people presenting heritage sites/assemblies in Timisoara related to the history of water in the city (materials that became available on the association's website [9], ATELIERE DE VACANȚĂ – de-a arhitectura (de-a-arhitectura.ro);
- to make guided tours for pupils (age category 8-14) and students;
- to make presentations in related fields - the presentations were made by a geographer (hydrologist), a landscape architect, a historian and an architect; the main issue was to present a multidisciplinary view on the theme of the workshops;
- workshops over 5 days, involving analysis, surveying, synthesis, debate and proposals for a better understanding of heritage and the relationship with water;
- -the production of separate models for each group, as a work done by the students and children with the proposal (with the idea of making heritage sites more child-friendly in mind);
- - a final event to disseminate conclusions and proposals, with the participation of the children's parents, students and teachers from FAUT.

### 3.4 Selected sites

The selected sites of the project were:

- the Water museum (opened in June 2023),
- Theresia Bastion - the National Museum of Banat,
- the Bishop's Bridge.

All these heritage sites are related to the history of water in Timisoara in different ways, which the children and young people were to discover during

the 5 days workshop.

Fig.2 Part of the team at the Water Museum (from [10])

### 3.5 Participants. The four teams

The project took place from 10 to 14 July 2023, and involved 35 pupils, 36 students from FAUT (1st, 2nd and 3rd year of Architecture, respectively 1st and 2nd year of the Furniture and Interior Design section, who did their summer internship), 5 teachers from FAUT and 3 tutors from De-a arhitectura Association, primary and secondary school teachers, 4 volunteers, 4 collaborators who gave lectures.

The participants were grouped into four separate working groups containing a similar number of pupils and students (8-9 pupils and a similar number of students), each grouped in turn into stable teams of two, so that each pupil could benefit from the constant guidance of a student. The 4 groups were coordinated by mixed teams made up of teachers from FAUT, the supervising architects and primary and secondary school teachers from DAA.

The three objectives were analyzed by the four teams, one group working at the bastion, one group at the water plant and two groups managing a bridge segment. The children were grouped according to age (two groups of 8-9 years old - one at the Bastion, the other at one end of the bridge, a group of 9-10 years old at the other end of the bridge and a group of 11-13 years old at the Water Museum), and the workshops dedicated to them in the groups took into account their specific age. The students were mixed in order to know each other better and improve the connections between students.

## 4 METHODOLOGY AND CHALLENGES

The steps taken in developing the project were as follows:

-organization of the teams before the 5-day workshop - this involved organizing the working pairs (FAUT teacher - DAA representative), assigning the volunteers, establishing the teams of children by age groups and dividing the students from different years into the 4 teams, establishing the general program, so that on the one hand a common program was followed (group trips to the objectives, lunch program, meeting with guests from different fields, boat trip on the Bega, etc. ), and on the other hand each team should have independence in the rhythm of the day and the choice of working methods (specific to the age of the children);

-development of the 5 workshop days - described in detail in 4.1;

-Post-workshop activities: generation of materials for teachers - activity sheets for activities that can be carried out during the School Week, collaboration with the Challenge team for the With a Splash on the Danube Challenge, reporting activities to the funders, dissemination of activities (participation in conferences, participation in the National Biennale of Architecture 2023, etc.).

### 4.1 Project activities

During the 5-day workshop the activities were carried out gradually and slightly differently depending on the group, and their detailed description can be found in the main article on DAA website dedicated to the project [10]. The first day included visits to the sites to be analyzed, where students and pupils were given a presentation of the monument. The children helped the students with the measurements, then had specific activities dedicated to them (Fig.3-6), and the students continued the work on the survey; as a conclusion of the day, the children told or drew individually their vision of that place in the future.


Fig. 3 The team working at the National Museum of Banat (from [10])

Fig. 4 Part of the team drawing in the courtyard of the Water Museum (from [10])

Fig. 5 Drawing at the bridge - one of the two team working at the Bishops Bridge (from [10])

Fig. 6 One of the team working at the bridge - studying and understanding the site (from [10])

Fig. 7 Treasure hunt in the Water Museum courtyard

On the second day, the two teams that had not been to the Water Museum on the first day were given a guided tour by the hosts, then the participants drew outdoors and the children did a treasure hunt in the courtyard (Fig.7). During the second part of the day the students started making models. The presentation made by architect C. Milincu was mainly intended for the students to learn how to make the models easier and better, but the children were fascinated, so in one of the groups the program was changed, as the children wanted to make their own models as well.

Fig. 8 Children making their own variant of bridge

Fig. 9 Together – another way of approaching the bridge

Fig. 10 Children working for their proposals (from [10])

On the third day all continued to work together in the studios (Fig.8-10), the day being completed in

the morning by the presentation on water heritage by geographer R. Văduva and in the afternoon by the film presented by Prof. A. Babeți on UFOs in Timisoara (film from the series Timisoara. Secret map.) (Fig.11).

Fig. 11 Presentation of Prof. A.Babeți

On Thursday, intensive work continued in the studios to finalize the models and proposals (Fig.12-13), the day being once again completed by a presentation - the one about the parks in Timisoara by landscape designer D. Crișan.

Fig. 12 Students working for the final models – the Bishop's Bridge

Fig. 13 Students working for the final models – the Water Museum

On Friday all the teams took a boat trip on the Bega, trying to observe and understand more about the water heritage in Timisoara, integrating the information that the children and students had learned during the previous days.

The highlight for all was at the end of the day: the joint presentation held in the amphitheater of the Faculty of Construction, attended by pupils, students and children's families (Fig.14-17).

Everything from the pre-project organization, to the running of the 5 days and the activities after the workshops has strengthened a project team that continues together.

Fig. 14 Final presentation – team working at the National Museum of Banat – children of 8-9 years (from [10])

Fig. 15 Final presentation – one of the teams working at the bridge - having their own individual models - children of 10-11 years (from [10])

Fig. 16 Final presentation – one of the teams working at the bridge - working in pairs - children of 8-9 years (from [10])

### 4.2 Working together

Feedback from teachers, architects, students and children showed that one of the best things for everyone was working together.

Fig.17 Final presentation – the team working at the Water Museum - children of 11-13 years (from [10])

It was important for the students to meet other colleagues from different years with whom they had not previously interacted.

One surprising interaction that left a lasting impression was between the children and the students. Because each child had a student looking after them, they communicated, befriended each other, in some cases kept in touch over the summer, and the children were fascinated by their connection with the students, telling all their friends over the summer holidays about the experience.

### 4.3 Interdisciplinary

The interdisciplinary part specific to the profession was provided on the one hand by the team of architects with different areas of expertise (heritage / sustainability / education / interior design) and teachers with different profiles, and on the other hand by the presentations that came from areas with which architects work: history, geography, landscape design.

### 4.4 Challenges

Among the challenges this project has raised should be mentioned:

-general organization: 4 teams made up of children of different ages, from different backgrounds, students who did not know each other and had never worked together before; these teams should also have a common program, have lunch together, etc.

-heat: the workshops took place during the summer, on particularly hot days, when it is difficult to decide how much to work outside and how much inside;

-children have a different rhythm than students, so each of the two team leaders had to make decisions about the ratio of working together to working differently, and this decision is also influenced by the age category; in the younger groups of children it is a challenge how long they manage to be attentive and involved in the activities;

-because for various reasons the original schedule changed in the last days before the workshops, the project team had to be prepared for quick changes, which was an additional difficulty as there were more than 80 people involved in the project in total.

### 4.5 Sustainability of the project. Dissemination

The sustainability of the project is ensured by all the materials that have been prepared for teachers, so that the general idea and the types of activities can be taken over in another form.

From another perspective, the sustainability of the project also depends on its dissemination on different channels and through different means, as I mentioned before (DAA channels – facebook, youtube), the With Drop on the Danube challenge [11], participation in the National Architecture Biennale, participation in conferences organized in Politehnica University of Timișoara.

### 4.6 The future of the project

Because it was possible to create a real welded team by carrying out these activities, we aim to continue these activities as:

-summer workshops – every year, but with half the team, because the effort to manage almost 90 participants for 5 days was significant;

-in the classroom – having all the materials for the teachers and the pupils available on the website;

-De-a arhitectura challenge (more than 70 works of pupils, but can still be uploaded);

- one-day family workshops with guided tours (to create activities for the entire family).

## 5 CONCLUSIONS

The project achieved its objectives in all its aspects,

but perhaps more important than this is the way in which people worked together and the more or less expected results of these interactions: the models produced were beyond the expectations of the project team and involved a substantial effort over a short period of time on the part of the students, the friendships that were built between teachers, architects and guests on the one hand, between the students on the other, and especially between the children and the students. As a conclusion, it was a successful experiment that should be replicated annually, if possible.

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# THE MIXED VIRTUAL/REAL MATRIX FOR EDUCATION: a mediating solution between remote and on-site learning

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**ABSTRACT**
One of the positive aspects of the pandemic has been the opportunity for people to experiment with an existing but untapped type of learning or working: online from home or from a favourite space. The ability to learn from anywhere has made this an increasingly sought-after feature these days. Moreover, access to education and the quality of learning are global concerns that can be addressed from an architectural point of view. However, remote learning presents a number of problems both psychologically and in terms of productivity and efficiency, currently unsolved. This article attempts to provide a solution both to preserve the possibility to learn from anywhere while mitigating the undesirable effects of online education by implementing mixed real/virtual matrix and Smart Multimedia Walls technology. The three-dimensional classroom is redefined by architects by adding the possibility to connect online the students, the professors and the spaces.
The use of meta-analyses method and design-based method provide a background for the current research, which follow a mixed-method for designing a novel learning environment and finding a suitable framework on which it can be implemented. The framework is a formulation of a more general system, referred to as the mixed matrix(real/virtual), which ensures a logistic for the extrapolated confluence of workspaces. From on-site to remote education and further on, reaching learning-from-anywhere, a solution for fully adaptable and interconnected educational spaces is presented. Virtual connections are understood as interchanging written, vocal or video content. The mixed matrix is about interchanging spaces with all their three dimensions.
Through the technology proposed for use, it aims to create a space where people can learn or work as if they were in the same room, in an authentic classroom atmosphere. Many of the mental, efficiency and productivity problems can be solved by these shared, supervised and organised spaces. The solution is both a mixed space in which classical learning and teaching can be fruitful and a space that educates in terms of designing learning and working programmes.

**Keywords:** architecture, psychology, remote learning, virtual matrix, innovative educational spaces, architectural education

# 1 INTRODUCTION

## 1.1 Background to the pandemic and current situation

In recent years, the idea of the emergence of the fourth industrial revolution [1] has been discussed in the literature as a paradigm shift in which the physical, biological and digital planes intersect, with the distinction between them becoming less and less visible. Nowadays, interest in innovation based on artificial intelligence and digital systems can be noticed, which is also acutely felt in the educational area.

Recent decades have seen the development of innovative and flexible learning space design principles that address student diversity. The term "innovative learning spaces" or "future learning spaces" refers to spatial design that encourages and supports dynamics, engagement and an open attitude towards learning. A learning-friendly space can bring essential changes from passivity and disconnection of learners to active exploration, collaboration and dialogue [2]. New learning spaces should promote an educational act based on pedagogical principles, while paying attention to learning theories, teaching content and teaching practices, but with an emphasis on the use of digital technology [3].

The Covid-19 pandemic has also significantly affected the educational system, leading to the need to reconfigure teaching programmes to ensure a qualitative educational act.

The easy transmission of the virus, the difficulty of diagnosis and high mortality rates have led to the adoption of global containment policies. One of the many social constraints to reducing infection rates has been work and home education. A significant percentage of each country's population ended up spending their time only indoors [4, p. 2].

The suspension of face-to-face teaching activities in favour of online ones has resulted in teachers and students being exposed to a high level of pressure. The transition to online education has been challenging, highlighting a number of issues and challenges. These issues are not new, but have become more visible and topical under the exceptional conditions mentioned. In this idea, the literature identifies two types of limitations in remote learning: external and internal. External obstacles are related to equipment, education, time and technical support; while the internal ones involve teaching systems and personal choices [5]. However, remote learning has a number of indisputable advantages, providing a learning environment independent of time and space. Institutions opt for remote learning modality for several reasons, some of which are: accessibility of the educational act, cost efficiency, increased quality of the educational structure, facilitation of the educational act for a specific target group, possibility of continuing education in exceptional situations, expansion of the educational capacity in new areas, association of professional and family life with the educational act and last but not least, conferring an international dimension to education [6].

## 1.2 Brief history of remote learning, pre-COVID-19 ways of learning remotely

Electronic learning, digital learning and mobile learning are widely used terms referring to the concept of online education, but their meaning may vary in scope and purpose. Basically, d-learning is a broad concept that encompasses both e-learning and m-learning [7]. In addition to these terms, other synonyms such as remote learning or online learning are also encountered. However, of all of them, e-learning stands out as being more comprehensive, and as such is used more often.

So the concept of e- learning is not a new one and there are multiple attempts to define it. The term first appeared in the public domain in 1999, although it is believed that the first event relevant to this phenomenon occurred in the 1920s, when a class lesson was broadcast by a radio station to the children of farmers in rural areas.

The idea of remote learning has long been used alongside traditional learning methods, but challenges and obstacles have been shared worldwide, suggesting that improvements are still needed. Remote learning aims to increase the quality of learning and involves a planned teaching and learning process that is carried out in a different way to conventional learning. Changing the way knowledge and information are delivered, the learning experience, remote learning requires organisation and communication based on digital

technologies and systems. The literature has revealed four basic components of remote learning, namely: 1. The corporate base; 2. Interactive telecommunications; 3. Data, sound and video sharing (the learning experience); 4. Separation of teacher and learner [8] .

The development of digital technologies also aims to open up new opportunities, providing access to the vast majority of the population to education through online educational resources. In today's digital sphere, online learning, blended learning, social media and open learning are essential for effective teaching.

## 2 Remote learning: needs, limitations and a new perspective

The intersection of family life and work is at a major crossroads today, with remarkable pandemic-driven changes in recent years. New questions are being raised about the future of remote learning and the creation of the necessary conditions for both, students and teachers. This article attempts to provide a solution to both preserve the ability to learn from anywhere and to mitigate the undesirable effects of this way of working by implementing mixed real/virtual matrix and Smart Multimedia wall technology. The proposed solution aims at more than just making larger monitors. Through the technology proposed for use, it aims to create a space where people can work and learn as if they were in the same room, in an authentic classroom climate. Many of the mental, efficiency and productivity problems can be solved by these shared, supervised and organised classroom workspaces.

Thus, the article proposes a discussion on the problems and challenges vs. opportunities and solutions associated with online learning.

### 2.1Problems and challenges

The literature has revealed a number of problems encountered by distance education users (students, parents and teachers) during the Covid-19 pandemic, [9]. Regarding the situation of parents and preschool or school children in primary and secondary education, situations such as difficulties in orienting children to learning, their lack of concentration, lack of desire to assimilate knowledge, desire to return to traditional face-to-face education and limited understanding of teaching material have been mentioned. Some of these problems can also be identified in university education.

Problems encountered by teachers during the Covid-19 pandemic are also highlighted, such as difficulties in in using online technology, planning, implementation and assessment of learning and collaboration with parents [10].

As far as the obstacles encountered by students are concerned, the literature notes a number of aspects classified on multiple relevant levels [11].

- Physical problems, like eye strain, being a common eye problem associated with prolonged use of electronic devices; body and muscle pain; migraines have also been associated with e-learning;
- Among the psychological problems, the most common disorders associated with remote learning mentioned in the literature are stress, anxiety and depression. Other psychological problems include: emotional instability, burnout , and sleep disorders;
- Regarding the issue of interaction in the remote learning environment, four types of interaction have been identified: student-content, student-system, student-student, and student-teacher interactions, all of which are connected by course effectiveness. In an educational context, effective interaction is extremely important. In this regard, some authors argue that teacher-student interaction affects students' learning, both directly and through the mediating effect of psychological atmosphere and engagement in the learning process.
- However, remote learning can cause social isolation. In addition, research shows that interaction between students and their peers and/or teachers is limited in the context of distance learning;
- Economic challenges also arise, including: longer teaching and learning time, adding to the workload and pressure on teachers and students. Additional costs related to various facilities including internet, hardware/software but also building spaces dedicated exclusively to online teaching.

Moreover, those working from home or working in hybrid modes face distraction due to the environment.

- Teaching assessment itself, becomes a key element in remote learning. The lack of physical interaction between participants in the remote learning environment makes the assessment/self-assessment process challenging. Exam security, the tendency among students to "cheat", along with exam delivery, are two of the major challenges of online education.

### 2.2 Concept and starting point – SML patent for educational spaces extension

The proposed solution successfully aims to improve and streamline the process of using the classroom space, allowing a multiple configuration according to different learning scenarios, depending on the type of activity carried out.

The workspaces at home (WH) can be located at home or in a temporary living space, in all scenarios being integrated into a mixed virtual-real matrix, as explained in Fig. 1.

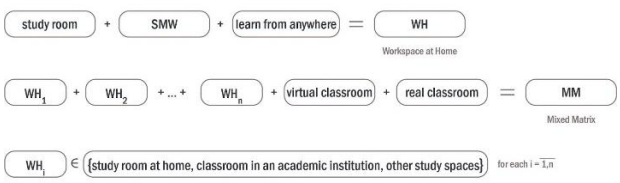


Fig. 1 Workspace at Home - design concept 1

Practically speaking, this approach from a mathematical perspective to the organisation of the common workspace consists of making a matrix of two to n elements, the elements being defined by workspaces from the categories mentioned above, namely: the home study room and the classroom space at school. These spaces link together, connecting and becoming extensions of each other's real physical space through the patented Smart Multimedia Wall.

The online environment is no longer reduced to connecting users via a monitor, which comes with a number of shortcomings, as the proposed solution foresees the delimitation of workspaces with Smart Multimedia Wall partitions (defined by patent), which take over the communication function of the connected spaces in this matrix, as shown in Fig. 2.

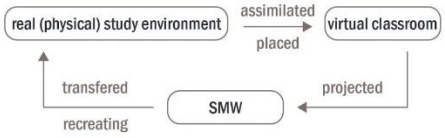


Fig. 2 Real / virtual workspace loop in the MM

Thus, we bring into discussion a new hybrid workspace, a mix between working at home online and in the traditional classroom space - on-site, with two major advantages:

- The first is that the user can work from any area he/she wants, not being conditioned by being on-site in the classroom, and at the same time can keep the classroom atmosphere with all the advantages that come with it, focus, active participation and efficiency;
- The second advantage is the flexibility and ease of building learning/teaching scenarios according to the needs of the moment, as people can be connected immediately, wherever they are.

## 3 Solution

### 3.1 Purpose and design decisions

As presented above, the greatest challenge of remote learning is satisfying psychological needs such as belonging in a group, bounding connections between team members and creating a small community in a certain space. By framing the educational activity in a physical environment, students became familiar with a certain learning space – the classroom. Remote learning usually involves transmitting a two dimensional image on a screen which is a strong barrier, diminishing the perception of the three dimensional common space hosting learning.

Ineffective communication was another problem caused by isolation and limited online communication methods. In remote learning, the inability to see the body language of students drastically affected the quality and frequency of communication and the quality of learning. The possibility of fully translating the real space into a matrix, of creating a virtual shared space where classmates can see each other just as they do at school solves this problem to a certain extent.

Showing on a large multimedia wall the image of classmates in real size leads to a simulation of the traditional classroom. Being able to fully perceive the colleague's body, more precisely the facial expressions, gestures, created space and more, and at the same time share the same information about oneself, introduces the student in an environment closer to the familiar classroom.
The starting point is Smart Multimedia Wall (SMW) after patent application RO133012A2. By reigning in the boundaries of physical space, such as walls, Smart Multimedia Wall (SML) goes beyond the simple function of enclosing space, offering the possibility to display multimedia content on both sides of its surface, while adjusting the level of privacy of the environment by varying the opacity.

### 3.2 Patent application - Smart Multimedia Wall

The Smart Multimedia Wall (SMW) relates to a wall/window type device that has the ability to intimate (0-100%) and play multimedia content on a transparent or opaque background, thus displaying multimedia content on both sides of the wall surface and adjusting the privacy level of the environment, as seen in Fig. 3. It can be used as a separating element between the exterior and interior environments of a building, as well as between compartments within a building, that is capable of changing its transparency in a controlled manner and can display multimedia content interactively[12].

The active surface of the SMW, showed in Fig. 4, is made by multi-layering the following components: outer protective surfaces made of glass 1, configurable transparent liquid crystal panels capable of displaying colour images using the RGB colour spectrum 2, glass sheets for structural support and stiffening located inside the panel 3, configurable monochrome liquid crystal panel 2 used for adjusting the ambient brightness by changing the degree of transparency.
The device is complemented by a data processing and control system 7, which is used to interact with external devices for the retrieval of multimedia content and to control the two colour displays 2 and the monochrome display 4. The data processing and control system has a power supply port 5 and a series of data communication interfaces 7 such as Ethernet, Wi-Fi, Bluetooth, HDMI, Display Port, VGA.

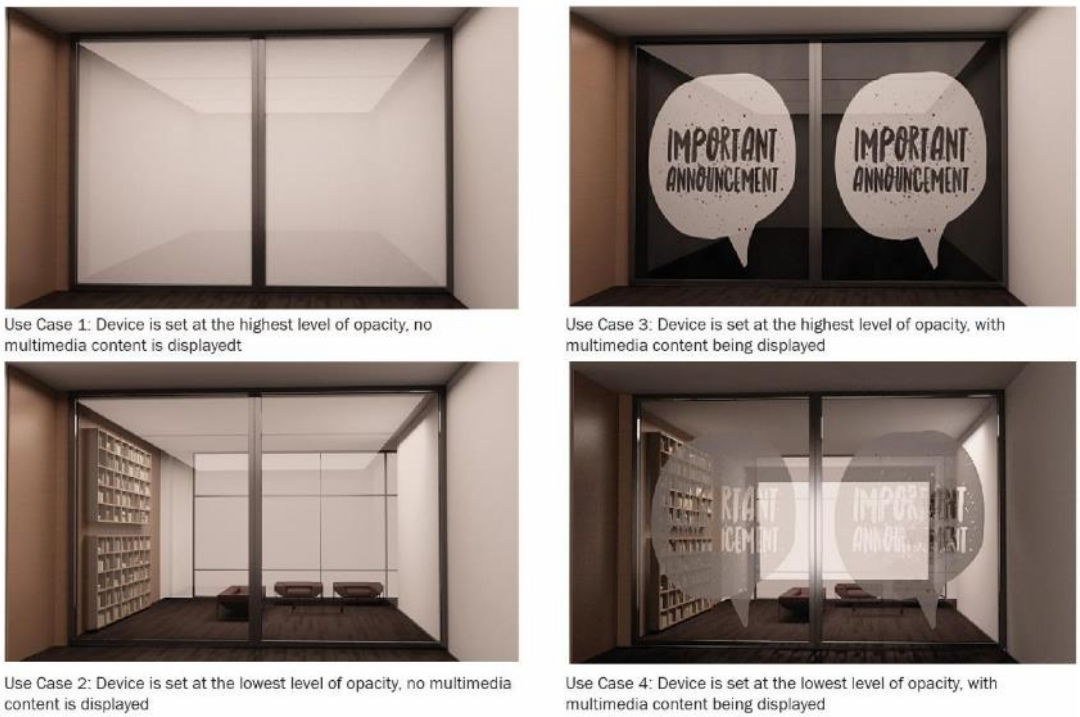


Fig. 3 Use cases for Smart Multimedia Wall (SMW)

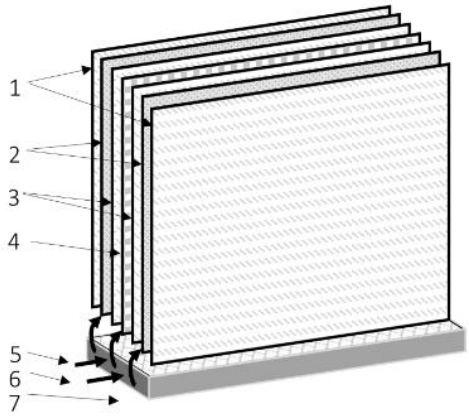


Fig. 4 SMW layers

### 3.3 The mixed real/virtual matrix for educational spaces in detail

All types of learning spaces, such as study room at home (Fig. 6), classroom in an academic institution (Fig. 7) or other study spaces, can be constituted in every WH by bringing spaces together. Virtual connections are understood as interchanging written, vocal or video content. The mixed matrix is about interchanging spaces with all their three dimensions. A classroom workspace is a collection of multiple WHs and each student can perceive, as a continuation of the personal space, the spaces in which the other colleagues are.

The mixed matrix is a framework with two kinds of spaces: virtual and physical. The virtual space is where the abstract linking is made between workspaces. The physical space is where one finds himself, in the WH with Smart Multimedia Walls which shows a projection of the space where another one is working, both being an element in the matrix. The overall created environment is a hybrid one, vanishing the limits

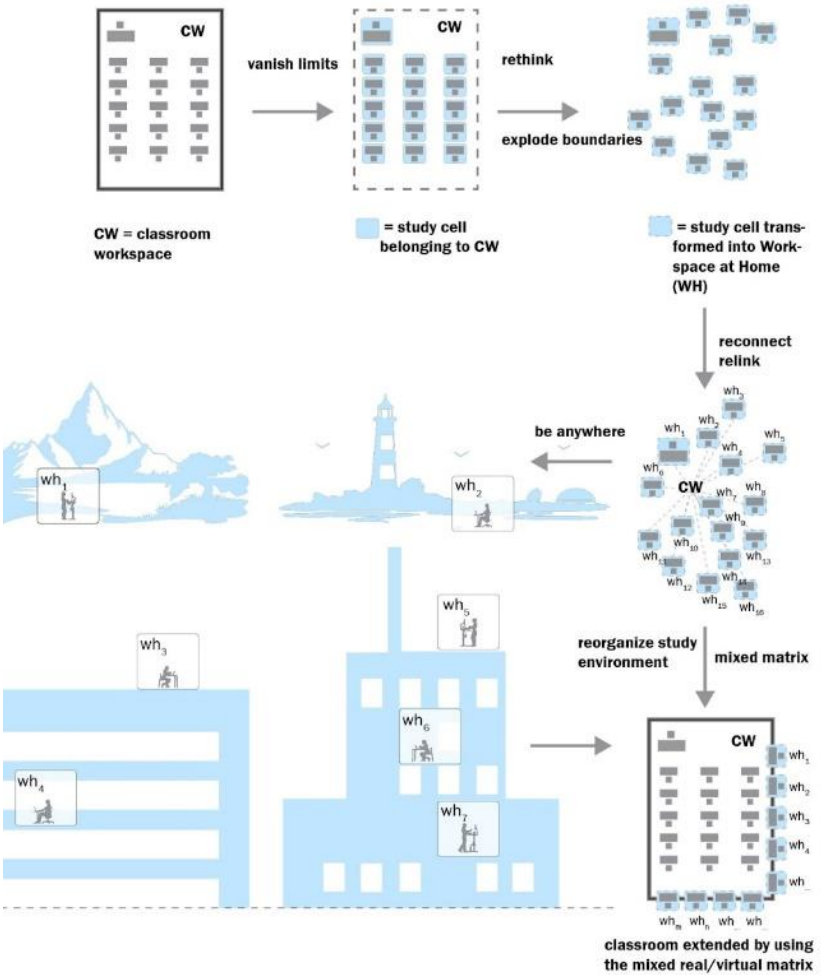


Fig. 5 Mixed matrix for learning spaces

of virtual and real -Fig. 5.

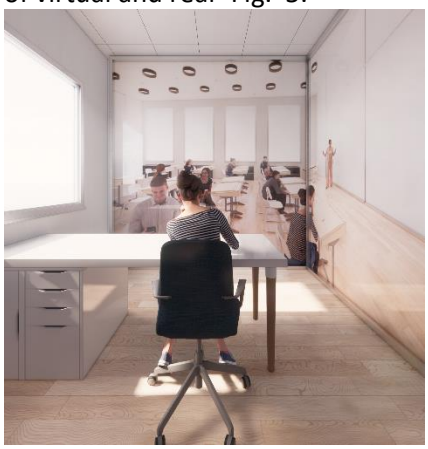

Fig. 6 Workspace at Home (WH) - connecting the classroom with the remote student by using SMW on two walls (the remote student in a study cell)

Fig. 7 Classroom Workspace - students at school together with remote students brought into the space by the SMWs

Fig. 8 Classroom Workspace – SMW separating the classroom from the corridor is turned transparent, visually connecting the two different spaces

## 3.4 New approaches and solutions for the existing problems

### 3.4.1 Emotional and social perspectives

The necessity of this kind of scheme follows the need of having a virtual structure on which all types of connections can be made, thus enhancing communication between colleagues. The conventional classroom, dictated by an architecture of physical spaces, is seen differently as a collection of Workspaces (W) interconnected, this time, by the virtual matrix. The circulation spaces that bound all the desks in a classroom, now understood as study cells, are equivalent to the virtual connections in the matrix, joining all the students and teachers in a united virtual space that is perceived similar to physical space (Fig. 7). All the physical limits in the classroom are vanished and the desks are taken out, deconstructed and understood as study cells, students having the possibility to join the classroom, now the classroom workspace (CW), with the Workspace at Home (WH). The next step is relinking the WHs in the mixed matrix, students now being able to learn from any scenarios (mountain, sea, urban setting, delta, etc).

Team activities can become similar to working in a physical classroom. The ability to render the entire workspace at home, to merge it with others and to generate a virtual common space eliminates the shortcomings associated with learning bounded by a monitor window or other online forms that are insufficient.

### 3.4.2 Organizing educational spaces - proposed solution versus traditional spaces

Using SMW and the mixed matrix, the traditional classroom has the possibility to extend by using the SML technology for two of the classroom's walls, thus enlarging the limited physical space and aiming towards future learning spaces. The classroom workspace (CE) is adaptable depending on the learning activities. On the SMW several scenarios are proposed, giving three multipurpose functional scenarios:

- extending to students: partially or totally adding study cells (workspace at home – WH - Fig. 6) with students from different locations - two major benefits are increasing access to education for families geographically located in areas with low possibilities (such as far rural lands) or giving the possibility to join students around the country (or even larger) for high performance training (such as national olympiad teams at science or other theoretical disciplines)
- location extending: projecting images, transferring the whole classroom to a recreated place - modern learning methods for

geography classes
- visually extending: by setting the SML fully transparent, the classroom is visually connected to the circulations or other adjacent spaces - Fig. 8

From a professor's point of view, assessment and reviewing work progress is much harder to do remotely, where students' bias to cheat is increased. The exchange of information about one's current state is an improvement on that matter.

## 4 Conclusions

Despite the fact that the pandemic was not the main cause of the emergence of remote learning, it was a revelation of this system. People had the opportunity to experience the advantages and disadvantages of remote learning on a large scale.

Although it has a number of drawbacks, mainly of a psychological nature, the mixed real-virtual matrix aims to address them and succeeds in satisfying both students, professors and families. These kinds of major difficulties in which society is forced to adapt to exceptional situations lead to approaches that can eventually materialise in solutions capable of improving traditional ways of learning, expanding the possibilities of collaboration (accessibility to courses outside the reach zone) and opening up unexpected directions for generating innovative future learning. Normal conditions can benefit from such solutions, towards a duality between online and physical learning. The solutions are designed to offer possibilities close to real, physical participation in the classroom, presenting a mixed modality of learning.

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# Developing competencies through experience-based learning processes in the field of territorial planning

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**ABSTRACT**
The traditional education systems have long focused on the formal passing of information, from one or more acknowledged specialists (the professors) to a group of uninitiated learners (the students) - in a gradual succession of controlled order. This practice has somehow created the illusion that one's professional success is determined by his or her capacity of retaining (and reproducing) impressive quantities of sheer data - without actually having to prove the ability of applying all this theoretical knowledge into practice.
However, during the last century, a number of alternative theories and practices have gradually emerged in the field of education, which switch the focus from an information-based, formal process to an experienced-based, informal one. This practice, similar to the organic passing of skills within traditional craft workshops, aims at developing competences through a gradual, controlled exposure of students (or apprentices) to real-life situations - which they have to respond to by using certain tools and methods provided by their coordinators.
This type of experience-based education has the dual advantage of helping the students to develop skills and abilities which are relevant on the labor market, as well as to produce meaningful results for the community while still in school.
At the same time, it helps strengthen the connections between academia, the economic environment and the civil society - while also easing the transition of future graduates from students to functional and active members of their communities. To this extent, the advantages of adopting experience-based learning processes not only reflect on the formation of young professionals, but also on the relevance of the academic environment in the present-day context - transforming universities into active stakeholders in the region.
One such process has recently been developed within the Faculty of Architecture and Urban Planning, Politehnica University of Timișoara, which builds upon the opportunity created by an ongoing collaboration between this institution and the Czech settlements from the Almăj Mountains (peripheral communities which are currently undergoing a phase of gradual revitalisation through responsible tourism). The authors are thus focusing on developing an intervention guideline for the safeguard and valorization of the existing heritage within the network of Czech villages in this area - involving students in the process. Following a thorough methodology for the analysis and interpretation of the rural environment, which defines a series of transversal principles - as well as specific research questions and instruments for each territorial scale of reference - this process aims at including students in all the stages of elaboration, gradually allowing them to discover the mechanisms of the profession, while also gently guiding them towards obtaining the targeted result.
This paper further focuses on explaining the applied methodology, as well as on weighing the outcomes of this kind of experience-based learning process - in relation to the formative impact it has over the involved students.

**Keywords:** experienced-based learning, research methodologies, intervention guideline for heritage valorization, formative impact

## 1 INTRODUCTION

The formal transfer of knowledge from one or more recognized experts (the professors) to a group of uninitiated learners (the students) in a steady succession in controlled order has long been the focus of traditional educational systems. This technique has somehow given rise to the misconception that one's ability to recall (and reproduce) enormous volumes of pure data determines one's success in the workplace, without the need to demonstrate that one can actually translate all of this theoretical knowledge into reality.

But in the past century, a variety of different theories and approaches have progressively surfaced in the field of education, shifting the emphasis from a formal, information-based process to an informal, experience-based one. This method aims to develop competencies through a gradual, controlled exposure of students (or apprentices) to real-life situations, to which they must respond by using specific tools and methods provided by their coordinators.

One such theory, developed in 1956 by Benjamin Bloom, in collaboration with Max Englehart, Edward Furst, Walter Hill, and David Krathwohl, is the *Taxonomy of Educational Objectives* [1] - a framework for classifying educational aims.

Often referred to as Bloom's Taxonomy, this framework has been used in the classroom by countless professors and instructors at colleges and universities.

Six main components made up the framework that Bloom and his associates developed: knowledge, comprehension, application, analysis, synthesis, and evaluation. Assuming that knowledge was a prerequisite for everything else, the rest of the five categories were classified as "skills and abilities."

Although there were subcategories within each group, ranging from simple to complicated and concrete to abstract, the six primary categories are the ones that most people associate with the taxonomy.

In 2001, an updated version of Bloom's Taxonomy was published. Thus, *A Taxonomy for Teaching, Learning, and Assessment* [2], released by a team of cognitive psychologists, curriculum theorists, instructional researchers, and testing and assessment experts, alludes to a more dynamic understanding of classification and detracts from Bloom's original title's more static notion of "educational objectives."

By designating their divisions and subcategories with verbs and gerunds (instead of the nouns of the original taxonomy), the authors of the updated taxonomy highlight this dynamic. These "action words" explain how intellectuals use their cognitive processes.

Experience-based learning offers the double benefit of assisting students in gaining employable skills and enabling them to make significant contributions to the community while still in school.

Simultaneously, it facilitates future graduates' transition from students to useful and engaged members of their communities and helps fortify the relationships between academics, business, and civil society. To this regard, the benefits of implementing experience-based learning procedures have an impact on the development of young professionals as well as the academic environment's applicability in the modern world, turning universities into engaged participants in the community.

This paper goes on to describe a recent such process that the Faculty of Architecture and Urban Planning, Politehnica University of Timișoara, has been developing as of late.

Building on the collaboration between this institution and the Czech settlements from the Almăj Mountains, this process focuses on involving students in the development of an intervention guideline for the safeguard and valorization of the existing heritage - following a methodology for analysis and interpretation of the rural environment, developed by the authors and presented in the following chapter [3].

## 2 METHODOLOGY FOR ANALYSIS AND INTERPRETATION OF THE RURAL ENVIRONMENT

In European culture, the countryside has always been particularly significant and has been vital to

the growth of our civilization. Rural areas "*are a core part of our identity and our economic potential*," as stated by the European Commission President Ursula von der Leyen [4], in an attempt to highlight both the symbolic and profitable features that define the countryside.

It is thus crucial for both individuals and communities to recognize, comprehend, accept, and honor the past in order to maintain rural places. But is our legacy's mere preservation and subsequent museumification sufficient, though? Or, alternatively, should our attention be directed toward interpreting, adapting, and respectfully transforming the beneficial aspects of the past, thereby preserving the relevance of rural structures and their corresponding mechanisms in light of contemporary realities?

Keeping these questions front and center, this paper focuses on an appropriate methodology (Fig. 1) for the analysis and interpretation of the rural environment, highlighting the built heritage's valuable qualities and its capacity to support thriving communities that are closely linked to the present economic realities.

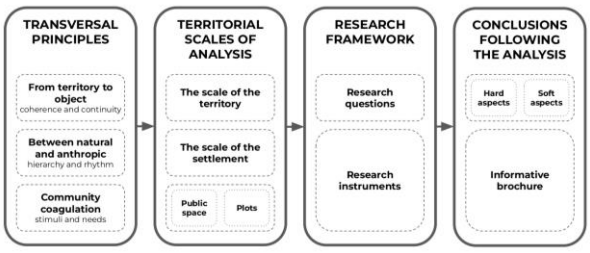


Fig. 1 Methodology for analysis and interpretation of the rural environment: transversal principles, territorial scales of analysis, research frameworks and conclusions

The methodology thus first takes into consideration the various rural region typologies, each with unique traits and difficulties - as well as a comprehensive analysis of previous theoretical studies and approaches regarding the rural environment.

It then goes on to define the framework of the research; to this extent, three primary principles stand out above the rest:

- preserving the continuity and coherence of the approach from the territorial level to the scale of an object;
- maintaining the hierarchy and rhythms between the natural and artificial components that define the ensemble;
- continuously adapting rural areas to the changing needs and stimuli in order to foster community cohesion.

Each of these principles then raises unique concerns, translated into research questions:

- how can we maintain the development corridors' continuity throughout the territory, while also avoiding conflicts between them and the natural world?
- how can we establish coherent hierarchies between the elements of the natural and anthropogenic worlds?
- how can we mediate ties between the public and private spheres, as well as between innovation and tradition?

Finally, the methodology defines the geographical boundaries of the study, focusing on three distinct territorial scales of analysis (the territory, the settlement and the object - be it the public space or the private household). For each of these three territorial scales, the methodology provides specific research questions, as well as the following analytical tools:

- the territory: the territorial chorema, whose purpose is to comprehend the settlement's role in relation to the major landscape unit, taking into account both natural and anthropological networks;
- the settlement: the settlement's structure aims to comprehend the organization of the settlement, taking into account the main mobility and economic corridors, as well as the relationship between built and unbuilt areas;
- the object: the public spaces scheme identifies the various public spaces within the settlement and explains their unique characteristics.

## 3 CASE STUDY: THE VILLAGE OF EIBENTHAL AND THE NETWORK OF CZECH SETTLEMENTS IN THE ALMĂJ MOUNTAINS

The Czech villages in the Almăj Mountains were founded during the 19th century as part of these territories' colonization with Central European

populations, initiated by the Habsburg imperial administration.

The purpose of these efforts was twofold:

- efficient exploitation of the existing resources in the area (forestry, coal deposits and other resources) in an organized system, by communities with experience in these areas;
- consolidation of the empire's borders - the Iron Gates being a critical area of direct contact with territories under Ottoman occupation (or influence).

Developed in hilly regions close to resources, the Czech settlements in the Almăj Mountains are far from major mobility corridors and are generally accessible via narrow, winding roads. The reduced accessibility and the gradual decline of the economic activities traditionally carried out by these communities contribute to the peripheral character of the Czech settlements - affected by depopulation and exclusion.

Today, however, these settlements are undergoing a phase of gradual revitalisation, with local communities developing a series of projects aimed at promoting local values and heritage, with a view to increase the level of tourist attraction and strengthen a resilient economy.

The network of Czech settlements in the Almăj Mountains includes:

- three settlements located in Caraș-Severin county, accessible from the Danube area: Gârnic | Gerník, Sfânta Elena | Svatá Helena and Bigăr | Bigr;
- two settlements in Caraș-Severin county, accessible from the Almăj region: Șumița | Šumice and Ravensca | Rovensko;
- two settlements in Mehedinți county, accessible from the Danube area: Eibenthal | Tisové Údolí and Baia Nouă | Nové Doly.

The meeting between our institution and the representatives of the Czech community in the Almăj Mountains - facilitated by the DANUrB+ international cooperation project (financed by European InterReg DTP funds) [5] - revealed not only an example of good practice in terms of tourism activities, but also a model of community development based on responsible tourism, which focuses on the valorisation of local resources and heritage.

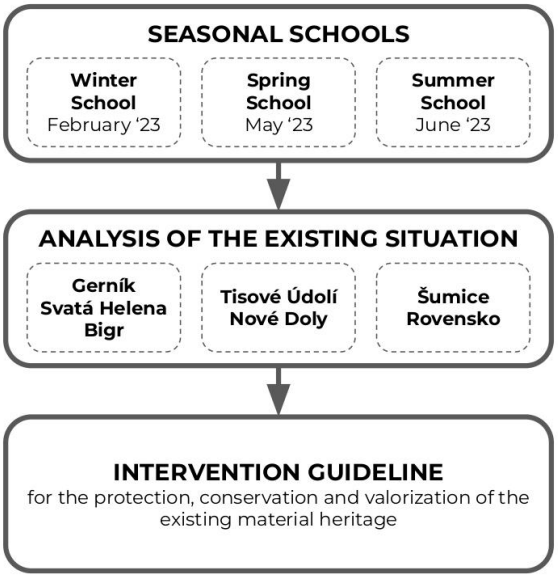


Fig. 2 The village of Eibenthal and the network of Czech settlements in the Almăj Mountains: research steps

As a result of the positive interactions brought about by the DANUrB+ international cooperation project, the representatives of the Association of Czech People in Banat (Eibenthal) invited the Faculty of Architecture and Urban Planning, Politehnica University of Timișoara, to develop an intervention guideline for the protection, conservation and valorization of the material heritage of the Czech settlements in the Almăj Mountains - as a guide accessible to all members of the community.

As a first step in this endeavor (Fig. 2), it was necessary to map all the Czech settlements in the Almăj Mountains. This gave rise to a didactic approach, materialized by three Seasonal Schools - during which students from the Faculty of Architecture and Urban Planning, Politehnica University of Timișoara, were guided in their field research in order to analyze and interpret the existing situation following the methodology described in the previous chapter.

Further on, this paper details the research methodology applied for the analysis of each

territorial scale - while also presenting the results obtained by the students.

### 3.1 The territory

The research methodology applied for the analysis of the territory focuses on the following research questions, which aim at identifying both hard and soft aspects (Fig. 3):

- What are the main landscape features in the study area (watercourses, landforms, vegetation masses)?
- What are the main mobility corridors in the study area (road, rail, non-motorised)?
- What are the main poles of attraction in the territory studied?
- What are the main economic activities in the study area?
- What are the main tourist attractions in the study area?
- What is the role of the settlement in the study area?

The results obtained following the analysis of the territory were further depicted through the chorematic representation (Fig. 4), which captures the Southern region of the Western Carpathians - highlighting the fundamental characteristics of the cultural landscape unit identified here.

First of all, it is located between strong natural and anthropic boundaries, as follows:

- the Nera river and DN57B - to the North and West;
- the Danube river and DN57 - to the South;
- the Cerna river and the major road and rail mobility corridor formed on this valley - to the East.

Between these boundaries, the Banat Mountains - comprising the Locvei Mountains (to the West) and the Almăjului Mountains (to the East) - stand out as major landforms. The slopes, valleys and forests occupying large areas define a specific landscape here, part of the Iron Gates Natural Park - thus constituting protected natural areas of national interest.

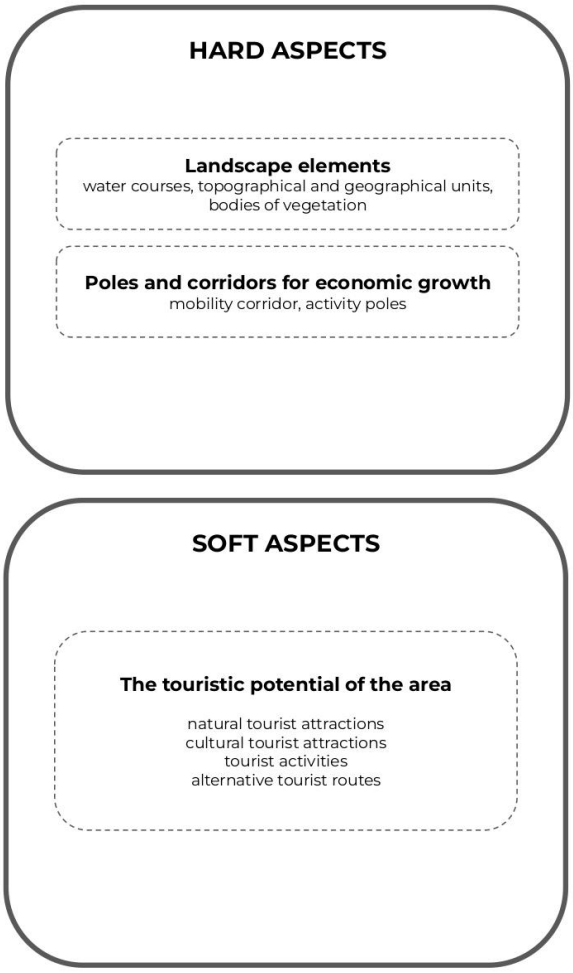


Fig. 3 The Almăj Mountains region: aspects for territorial analysis

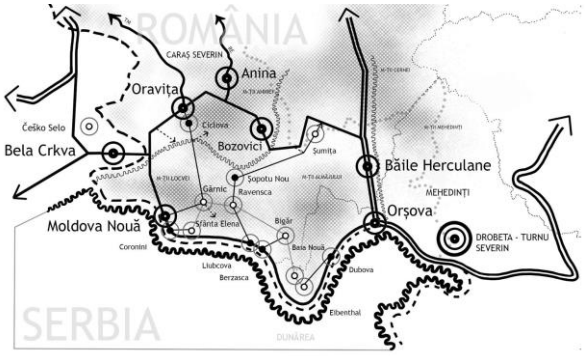


Fig. 4 The Almăj Mountains region: the territorial chorema

In this area, there is also a network of secondary roads, which cross the mountains both from North to South and from East to West, as well as several anthropic nuclei with a polarizing role, such as Oravița, Anina or Bozovici - to the North, Băile Herculane - to the East and Bela Crkva (in Serbia), Moldova Nouă or Orșova - to the South.

The network of Czech villages thus occupies an area with a rugged topography, far from the major mobility corridors (to which they are connected by narrow, sometimes unpaved roads). Organized in direct relationship with the natural environment, these villages form a coherent network at the territorial level, while preserving the specific characteristics of each settlement.

### 3.2 The settlement

The research methodology applied for the analysis of the settlement focuses on the following research questions, which aim at identifying both hard and soft aspects (Fig. 5):

- Is the settlement crossed by / bordered by one or more blue-green corridors? If yes, how does this relate to the presence of the natural element?
- Is the settlement located on / adjoining one or more major landforms? If yes, how does this relate to the presence of the natural element?
- Does the settlement include / adjoin one or more vegetation masses? If yes, how does this relate to the presence of the natural element?
- Does the settlement contain / adjoin one or more forms of protected biodiversity sites? If yes, how does this relate to the presence of the natural element?
- What is the main access route into the settlement?
- How is the street network organized (geometry, scale, dimensions)?
- How is the rural fabric organized (geometry, scale, dimensions)?
- How are the boundaries between the urban and rural areas treated?
- What are the main centers of interest in the settlement? What are the landmarks in the settlement?
- What are the main social and economic activities in the settlement?
- What are the main tourist attractions in the settlement?

The results obtained following the analysis of the seven settlements were further depicted through individual layouts regarding each settlement's structure.

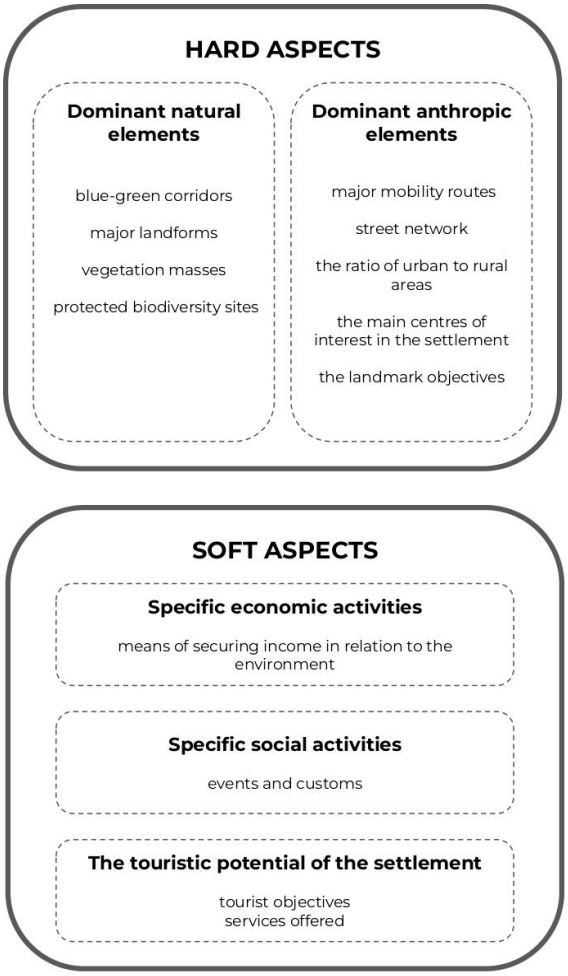


Fig. 5 The village of Eibenthal: aspects for settlement analysis

This paper further focuses on the case of Eibenthal, whose settlement's structure layout (Fig. 6) presents the fundamental elements for the development of the village through the two determining layers - the natural component and the anthropic element.

The natural environment is highlighted by the ecological corridor developed along the Tișovița stream, as well as by the rugged relief, characterized by steep slopes on both sides of the stream - part of the Iron Gates Natural Park. This setting provided the opportunity for the development of a linear settlement along the

existing valley, in close relationship with the water as well as with the surrounding landforms. Thus, the wealth of public spaces developed in relation to the water - including meadow areas (freely accessible to all or used as vegetable gardens), narrow crossings between properties (to ensure access to the water for all members of the community) or stream crossings (through the riverbed or with bridges) - stands out.

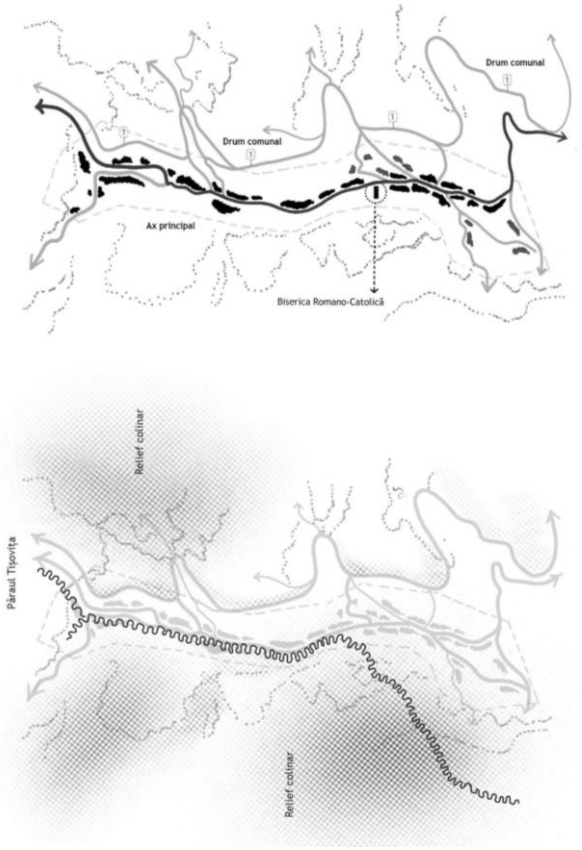


Fig. 6 The village of Eibenthal: the settlement's structure

The second layer - that of anthropic intervention - highlights the linear structure according to which the settlement develops, organized in relation to the main axis, oriented east-west (the road connecting with the main mobility corridor along the Danube), as well as with the valley of the Tisovita stream. Thus, the main access road descends towards the village from a height, then continues towards Baia Nouă (and the coal mine developed here in the 19th century, now closed) along the Tisovița.

The village center is organized around the local Catholic church, which, although not a historic monument, is a symbolic and architectural landmark of the settlement.

The linear development of the village, along the Tisovita stream and the main road connecting to the national highway, determines a specific organization of households. Thus, they are developed either between the road and the stream - or on either side of the stream, which becomes, in this situation, part of the street profile.Finally, the presence of the stream is also felt in the configuration of the network of public spaces in the village, mostly linked to the Tișovița stream.

### 3.3 The public space

The research methodology applied for the analysis of the public space focuses on the following research questions, which aim at identifying both hard and soft aspects (Fig. 7):

- What are the main types of public spaces identified in the settlement?
- What are the dimensions and plan form of the public space?
- How are public space boundaries (understood as the property boundaries between public space and private plots) treated? How are the fences constructed? How are the building facades treated?
- How is the horizontal surface of the public space treated? What is the ratio of mineral surface to green surface?
- What vegetation elements are present in the public space?
- What street furniture elements are present in the public space (lighting fixtures, water sources, litter bins, seating areas, any other functional or recreational furniture elements)?
- What are the main economic activities carried out in the buildings in the immediate vicinity of the public space (village shop, restaurant, etc.)? How do they influence the public space?
- What are the main events taking place in the public space (current, periodic, exceptional)?

The results obtained following the analysis of each of the seven settlements' public spaces were further depicted through individual boards

regarding each public area, whose particularities were showcased through both technical and artistic representations.

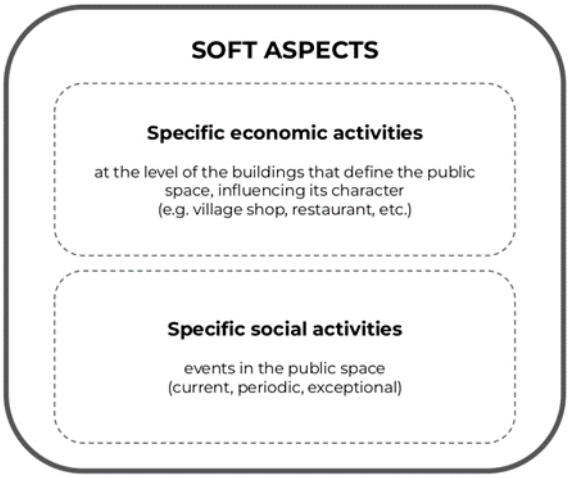


Fig. 7 The public space: aspects for analysis

## 4 CONCLUSIONS

The process described in this paper represents an opportunity for experience-based learning, providing students with a methodological framework which they then have to apply for gathering (and processing) data from a real-life situation. As such, students were guided in their explorations of the Czech settlements from the Almăj Mountains and encouraged to make observations on their own (Fig. 8). At the same time, the whole process was thoroughly regulated by the research methodology, ensuring that the results were relevant and adequate for the project.

Fig. 8 Students exploring the Czech village of Baia Nouă

Based on the diagnosis of the field research, the project will further focus (in the following months) on the elaboration of an intervention guideline for the protection, conservation and valorization of the existing material heritage - also to be developed in collaboration with students.

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# Architecture for all:
# Learning to build a better tomorrow

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**ABSTRACT**
BASEhabitat is a studio within the department of architecture at the University of Arts Linz, Austria. Together with our students, partners and university staff, we are committed to the development of environmentally responsible and socially just architecture and building practices, locally and globally, individually and collectively. The current climate and social crises shape our vision, our pedagogical strategies and therefore the curricula. Within our programs, the BASEhabitat Master degree and the BASEhabitat Postgraduate Degree, we design and build projects in Austria and around the world, we do research on material science and we partner with other universities in order to share our vision and tackle the most urgent issues of our times.
Faculties of architecture, engineering and urban planning produce the next generations of experts and, thus, directly influence the built environment of the coming decades. At BASEhabitat, we are convinced that architecture schools have a key role in shaping the future building culture. Re-thinking teaching methodologies and adapting them to present needs will inevitably lead to shifts in the production of space. Given the rapidly growing climate- and social-, as well as other global crises, the need for radical architectural didactics is urgent. In this sense, we aim to expand our approach and understanding from the mere design of individual objects to the production of liveable spaces for as many people as possible. We strive to widen our responsibility towards the overall building life cycle (production and supply chains, construction phase, use stage and end-of-life) by integrating the socio-political and environmental dimensions into the design and construction processes and by pioneering a horizontal and multidisciplinary approach.
This paper showcases the mechanisms and resources used at BASEhabitat to achieve these goals. As an academic institution, we benefit from an existing infrastructure that serves to constantly improve and develop new teaching methodologies with our students and staff. In the first part of this paper, we reflect on the global issues affecting our architectural culture and practice today. We then continue with a focus on the existing infrastructure and networks of our university, as well as on our current BASEhabitat curricula. Complementing the perspective of the teaching staff represented by Author 1 within this paper, are personal testimonies from a BASEhabitat Masters student Author 2, who reflects on her years studying at our university and shares her experiences within several BASEhabitat design projects. The decision to co-write the paper is based on the belief that teaching and learning are inherently connected and should be handled as a symbiosis.
Initially written for the Cohesion International Conference 2023 held in Timisoara, Romania, the paper serves a broader purpose, as a starting point for collective discussions between faculties and all groups involved in design and build processes: students, teaching staff, researchers, builders and do-it-yourselfers, communities and users, handcrafters, artists, partners and clients. We, therefore welcome readers to this debate and invite them to join our journey of rethinking the academic field of spatial development.

**Keywords** BASEhabitat, hands-on, design-build, regenerative materials, sustainability

## 1 BASEhabitat: VISION AND VALUES

We find ourselves in the midst of a rapidly escalating climate crisis, which threatens our future on this planet. The built environment lies at the center of this crisis and plays a key role in the upcoming years: academia, science and industry must come together and radically change the current production of space, as this is our only way towards an environmentally-just transition.

CO2-emissions generated by building operations have reached an all-time high in 2022 [1]. The buildings and construction sector remains alarmingly off track in reaching the Paris Agreements's goals of decarbonization by 2050, as building and construction industries still account for 34% of the global final energy consumption (Fig. 1) and 37% of the global energy-related CO2 emissions (Fig. 2).

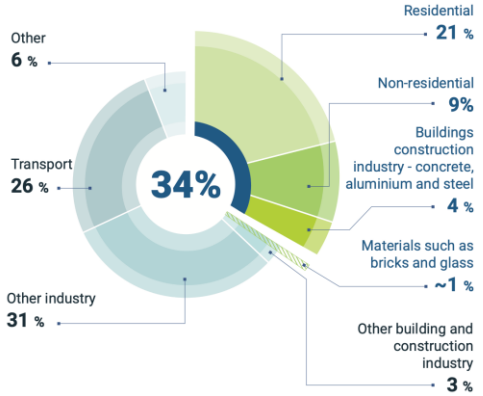


Fig. 1 Global share of buildings and construction final energy demand, 2021 [1]

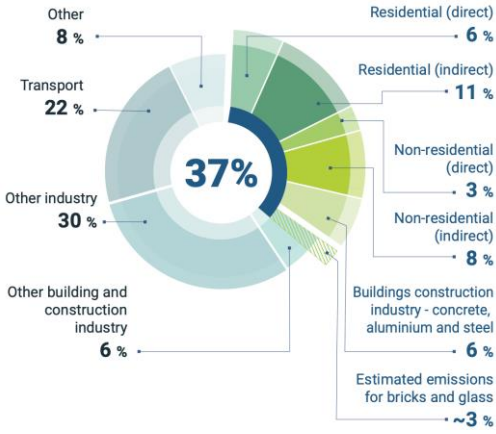


Fig. 2 Global share of buildings and construction operational and process CO2-emissions, 2021 [1]

The social and economic inequalities worldwide are sustained and exacerbated, not least, by the planning and building industry. The global construction market is estimated to grow with 85% by 2030 [2]. Associated with this growth are also ecological and social catastrophes such as the increasing global extraction and exploitation of natural resources [3], unsustainable waste management [4], the destruction of natural landscapes and ecosystems, high CO2 emissions due to production of building materials and transport routes, water scarcity [3] and soil sealing. Last but not least, we are also confronted with a considerable housing crisis, as the current housing markets are almost exclusively built on profit maximization. The commodification of housing makes just living unaffordable: between 2020 and 2021 average rents in the European Union have increased by 19%, house prices by 47% [5].

The way we design, build, maintain and dispose of our buildings, neighborhoods and cities is, therefore, essential in changing our future for the better.

Aware of these global challenges, BASEhabitat has been teaching, designing and implementing environmentally sustainable and socially just architecture since 2004, developing exemplary projects locally and around the world [6]. As our alumna, guest professor and colleague Arch. Anna Heringer states, "architecture is a tool to improve lives. As architects, we do have the power to influence the society and make a change. Rather than exploiting our planet's precious resources, we can be sensitive and graft what we find locally."[7] Our goal is the democratization and reorientation of the architectural profession back to serving the many and providing quality living spaces for all. In the long run, we work towards setting sustainable and lasting practices in design culture for the coming generations of architects.

## 2 PREPARING THE NEXT GENERATIONS

In this chapter, we describe our didactic methods, experiences and lessons learned along the way, using the BASEhabitat Master program [8] as a guiding reference. The BASEhabitat

Master is a two year program, each semester intertwining specific focus points: design-build projects, material science, socio-economic theory in the global context, project planning and management. We explore teaching methods that are horizontal, flexible and cooperative.

### 2.1. Design projects

The core of the BASEhabitat Master program are the design projects, which introduce the students to all stages of the professional reality:

- **Stage 1** represents the initial preparation work. This stage is carried out during a field trip to the specific location of our proposed site. The students dive into the given local context, get to know the community and users, meet relevant partners and stake-holders. The methodology used in this phase includes group work, qualitative interviews, resource-mapping, outlining expectations and desires, photo, audio and video recordings, sketching, subjective observation during walk-arounds and groups hypothesizing. The information is then processed and fact-checked within a broader target group, to avoid potential bias: for instance, in Fig. 3, the BASEhabitat Master students verify the information gathered during their field trip in Gaborone, Botswana by directly engaging passing-by Tswana citizens in the city center.

Fig. 3 Research trip in Gaborone Botswana (Photo credits: Flavia Matei)

The outcome is a thorough documentation of information and experiences, that help students formulate their individual, context-adapted design task, on which he or she will continue working throughout the semester. We emphasize the fact, that the design task is not given a priori, but is the result of this initial, on-site research carried out by the students.

Stage 2 brings us back to the university: Wednesdays and Thursdays are lecture-free and dedicated exclusively to the design projects. Each student has an allocated work station in the common rooms, to use for the duration of the semester (Fig. 4).

Fig. 4 Common rooms at the University of Arts Linz (Photo credits: Stefanie Hueber)

During the weekly design days, students can either work individually on their projects or request feedback from the BASEhabitat teaching staff.

During the end term reviews, the students present their work directly to the project partners, clients, users or guests, wo engage in a discussion and offer feedback. This setting ensures a real sense of responsibility for the students regarding the methods they choose for pitching their projects - as some designs could also be built in the following semesters.

- **Stage 3** brings the students to a BASEhabitat construction site, where they will be part of the practical implementation of a project, for a period of three months. In preparation, the students are introduced to the projects's administrative, such as working on required building permits and execution plans, understanding safety regulations, reflecting on their role within the project structure and their role as guests in the hosting community.

Fig. 5 BASEhabitat students at the Baan Doi construction site in Thailand (Photo credits: Paul Eis)

The building practise is an essential teaching method that helps students gain a deeper understanding of the connection between the design and the built result. Co-creation formats are an essential tool at this stage, in bringing the students together and ensuring a fruitful teamwork, but also inbuilding trust towards the hosting community and to the local partners.
The practical experience on site offers hands-on knowledge of tools, building materials and techniques and presents the opportunity for the students to learn to adapt on-site to unforeseen situations (Fig. 5). In addition to the 1:1 building experience, the students also have the opportunity to put in practice theoretical project management tools by living and interacting in an unfamiliar socio-cultural context, continuing the communication with the project partners and stakeholders and by acting as BASEhabitat ambassadors throughout the building practise.
The overall experience is documented by the students and presented to their colleagues in Linz in various mediums (web-blog, info night, videos, podcasts etc.).

- **Stage 4** is the post-occupancy assessment, in which BASEhabitat projects are evaluated if the initial goals have been met. This stage is carried out at least one year after building completion, by the same group of students, a different group of students or by BASEhabitat staff.

### 2.2. Practice-oriented design-build: a student's perspective described by Author 2, Masters student at BASEhabitat

*The design training courses are an excellent way to begin the BASEhabitat Master studies. Together with architecture students from all semesters, different design tasks are solved collaboratively, in groups. This ensures a good mix between the faculty's four design studios and easens the students' integration within the University of Arts Linz. Communal spaces, such as the students' kitchen, the workshops, the common rooms or the roof terrace are important hubs for everyone to meet and socialize. The work stations are very practical for working on our design tasks and exchanging ideas.*
*The number of BASEhabitat students within the Master program is manageable, which strengthens the sense of community. Even though we are no longer all based in Linz and are all working on different projects around the world, this connection across national borders remains intact - as we are all united by the belief that social and ecological architecture is a necessity. As BASEhabitat students, we get very close to reality in our projects and through the specific courses on material science. We get into direct contact with clients and learn how to integrate their wishes and suggestions into our designs.*

Fig. 6 Community center for people with disabilities in Romania (Photo credits: Author 2)

*My first design project (Fig. 6) was based on a collaboration with an international NGO, that*

*wished to plan and build a community center for people with disabilities in Cisnădioara, Romania [9]. Part of our design task was to learn how to engage with the clients, users and community, in order to understand the local architecture and adapt inclusive design strategies, and learn how to integrate locally-available ecological materials into our designs.*

*Due to all the factors mentioned above, students approach the design tasks with an additional motivation that was new to me – especially because of the real possibility of implementing our projects in 1:1 scale. Unfortunately, in the case of the Romania project, the Covid19 pandemic made the implementation of the project impossible, as the existing budget was re-allocated to emergency aid. These are the less pleasant sides, but they teach us, students, that projects that are not realized are just as much part of the reality of the architectural practice.*

[1]

Fig. 7 Pavilion Botanical Garden Linz, Austria (Photo credits: Stefan Hausherr)

*In the second design project, we worked in a group of three to develop a pavilion for the Botanical Garden in Linz (Fig. 7 & 8). We held regular meetings with the clients and were able to better understand their ideas and expectations. Within one semester, we were able to design, plan and build a pavilion with our own hands. [10] This was a real challenge in terms of time management, but also an instructive experience, as design decisions and the coordination of the building site had to respect a strict deadline. Mastering such a task under time pressure was not easy, it took a lot of communication and cost a lot of energy. In addition to designing and planning, there were many tasks to master that do not occur in more theoretical designs: creating a material order list and coordinating the budget, preparing the site and drawing execution details – up to the last screw. In addition, there was the allocation of work tasks on the site and the scheduling.*

*Another unexpected challenge was that the materials were delivered in different sizes than ordered. Spontaneous discussions and fast adaptation were needed on-site in order to find solutions to the existing construction plans.*

[2]

[3]

Fig. 8 Pavilion Botanical Garden Linz (Photo credits: Kurt Hörbst)

*This was a particularly intensive time, as other university courses also demanded our attention and time. Despite all, we now have a project that we have designed, planned and built together. This is a wonderful feeling and I see it as a gift to have been given this opportunity during my studies.*

*My third semester at BASEhabitat took place on an international building site in Casa Branca, Portugal. These projects are either developed in other semesters within the BASEhabitat design studio or are external building sites, that meet BASEhabitat requirements. We traveled to Portugal to renovate the 1920s-1940s former buildings of railway station employees, so that they could then serve as studios for local artists. The three months spent on-site allowed us all to dive deeply into the mentality of the project initiators and the local community. We learned*

*that it doesn't always have to be the conventional norms of construction that equate to structural upgrading. A lot can be achieved with smaller, but more significant targeted interventions.*

Fig. 9 Arch of bricks – BASEhabitat building practise in Casa Branca, Portugal (Photo credits: Author 2)

*During the building practise, we learned how to slake lime, how to build interior walls, arches (Fig. 9) and chimneys with recycled bricks from nearby demolished houses and how to replace old plasters: starting with the preparatory work, to mixing abd applying the base and finishing for clay and lime plasters. In addition, we learned the Portuguese lime smoothing technique with all its necessary steps. In a two-day workshop, we were allowed to design, shape and glaze the kitchen tiles for the project. We also learned how to replace and/or improve a roof construction, how to develop and install cork insulation, and how to build the entire roof construction - from the wooden cladding inside to the cleaning of the roof tiles and the re-covering of the roof.*

*We were allowed to be part of decision processes, develop execution details and learn which tools are needed on site along with which procedures sequence. This learnt lessons increased our self-confidence enormously and encouraged us to engage, work hands-on and think things in a new and simpler way. It was not always easy for us to get involved in the construction processes and in the coordination of the construction site, as the latter was not always solved coherently from the students' point of view. Overall, it was an impactful time and a place that some students will revisit for further collaborations - a connection with the project and the people that we all don't want to miss.*

### 2.3. Complementary to the design projects

In order to maximize the learning potential, the theoretical lectures, seminars and workshops are adapted yearly to requirements of the design tasks. For instance, the material science course emphasizes specific materials and techniques which are relevant to the current design task, while the 1:1 workshops (Fig. 11) prepare the students and provide them necessary skills for the future building practise they will be attending.

Fig. 10 Bamboo Workshop at the BASEhabitat Summer School (Photo credits: Philip Steiner)

Furthermore, students can use the university workshops (for model-making, carpentry ceramics or metalworks) or our material-lab in order to build prototypes or test materials.

However, the curricula do not always meet all students' expectations. While some students profit from the challenges in the master program, others are unhappy with the work load and demand. As teaching staff, we reflect on our students' feedback and adapt the curriculum accordingly, so as to make it as accessible and informative as possible. Here is another testimonial from Author 2, presenting valuable critique on the positive and negative aspects of our program:

*The modules "Social Space", "Methods for*

*Spatial Analysis", as well as "Global Development" are important components of our studies at BASEhabitat: they strengthen our sensitivity to our environment and make us understand our role as architects in a global context, in an interdisciplinary way. I also see the course "Storytelling" as an important contribution for us as mediators in our projects, because we learn how to present our ideas to the clients and users and how convince them of their value.*

*The 1:1 material workshops give us the chance to interact with natural building materials directly. I find this a very important teaching approach. Although it is difficult to grasp the diversity of materials in just a few days, it motivates us to further explore them and their potential. In addition, the guest lectures held by international experts in various fields are an important insight into the practice of architecture. All these connections are available to us for questions - that now also arise, for instance, in my master's thesis. A large network has been opened for us students in Linz at the BASEhabitat Master. I'm taking all these experiences, the networks and sustainable, ecological building strategies with me.*

*However, there are also downsides: what I view critically regarding the curriculum is that an in-depth understanding is only possible to us, students, if we invest significantly more time than the 25-30 hours envisaged for one ECTS. This is not easy, in addition to the time-consuming design tasks and other life priorities on the side. Perhaps there is a way to achieve a more efficient time plan in the future.*

### 2.4Completing the Master program

*My master's thesis deals with the conversion of a heritage-protected building from 1743. The motivation to change something existing, the rediscovered passion for handicraft, as well as the self-confidence to work as a craftswoman can be implemented best here. Furthermore, circular economy [11] and cascade use are a central approach. Together with my project partner and experts, I am also researching an interior insulation made of fibers and lime. I want to show that DIY-construction and ecological building methods can also be scientifically based.*

*Fig. 11 Interior insulation – Master's thesis conversion of an old farmhouse, Switzerland (Photo credits: Author 2)*

*The experience gained at BASEhabitat gives me the self-confidence to start my own business. I wish to combine design and handicraft professionally, to introduce future clients to natural building materials and to prove their necessity. I also mitigate for dealing with existing structures and oppose the enormous CO2 emissions associated with demolition. My wish for the future is that the use of sustainable building materials will become the norm in the construction industry.*

## 3 CONCLUSIONS AND HOPES FOR THE FUTURE

BASEhabitat teaching strategies are constantly transforming. While our students are more and more conscious of the pressing issues of our times and, for instance, refuse to travel by plane due to ecological concerns, we must also adapt the content of the curriculum accordingly.

This paper would not be complete if we would not critically look at our own practices and ask ourselves what we can do better in the future. Here are our thoughts and ambitions on further developing our methodologies:

- implementing circular economy principles at a much broader scale and promoting restorative and regenerative designs in theory and practice
- further exploring interdisciplinary and intersectional approaches in the communication and cooperation with our users, partners and

stakeholders

- finding more reflection space in our curriculum on existing hierarchies in local and global contexts and exploring solutions to decolonizing teaching and learning processes
- maximizing students engagement by further developing horizontal teaching frameworks and encouraging collaborative, co-design practices in projects and on sites

We hope to bridge the gap between teaching staff and students in the academic field and offer more space for equal partnerships – let this paper be merely the start of such cooperations and represent a positive example successful team work. We hope our methods, our projects, our stories and our experiences inspire the readers to go beyond classical teaching frameworks and hierarchies and innovate hand-in-hand with their students – for here lies the true potential for growth. We do not claim to always be successful, but we are committed to keep on trying.

## 4 ACKNOWLEDGEMENTS

We would like thank Prof. Sigi Atteneder, department lead of the Faculty of Architecture and Studio BASEhabitat at the University of Arts Linz, for his generous confidence and support in our work. Without his trust, we would often not have the courage to pursue new challenges in the international academic field. This collaborative paper is one such example – and we hope it to be an impulse for many more to come!

We also give thanks to the BASEhabitat team, the students and staff, which all contribute to making our faculty the unique environment that it is.

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# Non-hierarchical architectural pedagogies for alternative sustainable futures

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**ABSTRACT**
The global ecological 'polycrisis' that affects biodiversity loss, climate change and social inequalities make it urgent for humanity to accelerate the transition towards sustainability. While the recognition of this urgency is widespread, a lack of alternative models for creating a more sustainable world exists. Prevailing perspectives suggest that the remedy lies solely in technological top-down approaches, such as smart, innovative, and green solutions. However, scholarly literature in the field of co-production argues that the solution must originate from within the affected community rather than being imposed externally. Within architectural pedagogies, codesign and co-making is emerging as methods towards collaboration of diverse stakeholders at different levels and scales. As professionals and educators, it becomes imperative for us to foster the capacity to conceive projects that are inclusive, socially appropriate, and aware of climate change and related crises. Urban planners, architects, and designers assume crucial roles in the transition towards a more sustainable world as they shape the future. However, the question arises as to how students in design-oriented disciplines of the built environment can unlearn the modernist paradigm of design thinking, characterized by an authoritarian, aesthetics-focused, and universal approach, and instead embrace a method of designing the future that entails non-hierarchical collaboration with communities, other designers, experts and end users, addressing 'the local' (e.g. challenges, resources, contexts) and designing sustainable projects. This paper explores non-hierarchical architectural pedagogies that revolve around the creation of alternative models for sustainability, employing methodologies such as literature review, co-design and co-making workshops in a live project involving architectural students and tutors at Festival of Architecture Schools of Tomorrow (FAST) in Timișoara, Romania. The paper's conclusions address issues pertaining to how architectural pedagogy can cultivate awareness of its role in facilitating the transition towards a more sustainable world.

**Keywords** non-hierarchical architectural pedagogies, alternative imaginaries, sustainable futures, design education for sustainability, sustainable development goals

## 1 INTRODUCTION

The global ecological 'polycrisis' [1], which encompasses biodiversity loss, climate change, and social inequalities, emphasizes the urgent need to accelerate the transition towards sustainability. The latest UN Report on the progress of the Sustainable Development Goals (SDGs) strikes an alarming tone, declaring that we are facing a situation of simultaneous crises. While some goals have made progress, others have stagnated or even regressed. Progress is mostly localized in developed countries, particularly in areas like digitalization and innovation and there are goals where learning transfer is difficult. However, this model cannot be easily applied to low-income or impoverished countries, nor to sectors such as education, poverty alleviation, and biodiversity [3]. In this paper, we will explore the ways in which architectural education can establish connections and contribute to the advancement of these sectors in achieving their goals. The construction sector, and its associated goals related to sustainable cities, lacks comprehensive data. Informal settlements are on the rise, indicating a housing crisis with limited options for the poor. Urban transportation remains inadequate, inaccessible, or unsustainable in developing countries. The issue of access to open public spaces also persists, impacting the quality of urban life globally. Public spaces are essential for inclusivity and social cohesion in cities. Consequently, the case study we are examining here revolves around an educational experiment that explores the collaborative design and construction of a public space by architecture students and their tutors.

At the same time, SDG 11, regarding cities and communities, has the highest deficiency in data collection, as stated in the 2023 UN SDG Report. This implies that our sector is not fully committed to the task of creating a more sustainable world, despite being responsible for over 40% of global CO2 emissions [3], [4]. Not only are we not on track to achieve decarbonization by 2030, but recent data shows that "the gap between the sector's actual climate performance and the decarbonization pathway is widening" on a global scale [3].

The necessary change must be systemic, and world leaders are pledging to promote "high-quality baukultur," a culture-centered approach to the built environment. They recognize the urgent need for a holistic perspective on the built environment and a humanistic approach to how we collectively shape our living spaces and the legacy we leave behind [5]. Architectural education is seen as a critical point in transforming the current 'baukultur' paradigm. Architects are also acknowledging the need for radical measures in their practices to lead us towards "a sustainable, equitable, and inclusive future for all" [6].

## 2 ARCHITECTS AND ALTERNATIVE VISIONS FOR SUSTAINABLE FUTURES

Although, the concept of sustainability in itself in the architectural field remains a topic of ongoing debate, particularly when considering alternative concepts like 'regenerative design' [7], [8], in this paper we adopt the well-established definition of sustainable development put forth by the United Nations in 1987 which emphasizes the imperative to address the needs of the present generation without jeopardizing the capacity of future generations to meet their own needs [9]. While the urgency of sustainability is widely recognized [7], there is a lack of alternative models for creating a more sustainable world [10]. The dominant narrative often suggests that the solution lies in top-down urban approaches, characterized by smart, innovative, and 'green' cities. However, there are scholars who criticize this monopoly on pre-packaged solutions, which tend to maintain the status quo by offering technological fixes and leaving little room for the emergence of collective 'alternative imaginaries' [11]. The concept of 'alternative imaginaries' is crucial because "future visions shape actions in the present, which cumulatively shape the future as it emerges'' [12], [10]. To bring about the radical sustainability transformations needed in our societies and cities in times of ‘polycrisis’, we must create space for alternative visions that challenge the dominant technological narrative and are built collectively

[10]. How we envision together the future significantly influences our actions in the present [13], [12]. Our perceptions of the future drive our responses to sustainability issues and are influenced by the knowledge that is mediated to us [14]. Therefore, it is essential to critically examine and question the prevailing hegemonic visions and actively contribute to the development of alternative visions for a sustainable future for all.

Architects can play a pivotal role in envisioning alternative models of sustainability , primarily because their profession centers on conceiving and designing future spaces, thereby shaping how we will inhabit the planet in the years to come. In a previous paper, we argued that architectural design can support the emergence of alternative sustainability visions when it engages with practices of commoning in ways that are situated in a specific urban context, mediated to various actors and levels, and relational in the sense that they foster long-term networks and connections between participants [10]. However, considering the mechanisms of knowledge production (i.e. who is financing it, with what goals), there is a urge to explore how architectural education can be reimagined to train architects who can actively contribute to co-creating these alternative visions of sustainability. This education should be non-dependent of hegemonic knowledge imposed by private companies seeking to produce experts to promote and sell their technological products [15], such as through the smart solution industry or the ‘green’ built environment narrative.

## 3 NON HIERARCHICAL ARCHITECTURAL PEDAGOGIES

In the realm of design, particularly in architectural design, the concept of individual authorship remains entrenched. Many designers operate without ever critically examining the 'material and economic dimensions of production' (p. 125) [16]. Consequently, this prevailing form of objectifying authorship runs counter to 'authentic practices of collaboration and design rooted in relationality' (p. 125) [16].

Still adhering to the modernist paradigm, the practice of design often relies on 'siloed thinking,' [16] even though the SDGs are intended to be addressed through an integrated and transdisciplinary approach [17]. Furthermore, as we've demonstrated, alternative futures should be co-created rather than envisioned by a single mind. According to some scholars, the solution lies in the development and experimentation of architectural pedagogies that seamlessly integrate both a 'humanistic and scientific perspective' in relation to the SDGs (p. 808) [18] relating to a culture-centered approach to the built environment [5]. Students are sending bottom-up signals indicating their desire for a 'transformative design education' that reconfigures traditional 'hierarchy models and feedback structures' within studio environments [19]. And indeed, an essential aspect of decentralizing the authority of the designer and promoting a more relational and collaborative approach, both in the design process and in design education is addressing issues of hierarchy. „architecture educator and scholar Adriana Granato [18], this new pedagogy for the SDGs should prioritize relationality. For example, students should be exposed to a wide range of perspectives, including those of users, fellow designers, specialists, and non-human entities. Teaching and learning should be a two-way process, with peer-to-peer learning allowing students to learn from each other in a horizontal fashion. The final results of the design process should be critically evaluated by peers and external actors, such as users, faculty staff, specialists, and non-specialists, tested and evaluated through participatory observation.

In collaborative design efforts, students must recognize their agency in actively shaping and refining design solutions as well as the curriculum itself, determining what they wish to learn. The sharing of ideas, resources, and learning tools should take precedence over internal competition dynamics. Students should develop a personal and in-depth learning method to become autonomous in their research [18] (p. 811). Tutors should encourage students to explore potential research pathways beyond the course or studio project.

Working groups of students and tutors should

embrace as much diversity as possible in terms of intellectual and physical abilities, gender and cultural background, fostering an environment that challenges comfort zones [18].

Live projects, within the framework of participatory design teaching methods [20] and constructivist learning [21], [22], offer a glimpse into how non-hierarchical architectural pedagogies can be built-up. For example, live projects are established in real-world settings, involving genuine stakeholders who have an interest in the design issue at hand. Nevertheless, live projects are intentionally structured to create a productive learning environment, setting them apart from larger-scale "real" projects [23].

Henceforth, non-hierarchical architectural pedagogies aimed at fostering alternative visions of sustainability should address the following key aspects:

Horizontal engagement: encouraging a shift away from individual authorship towards a collaborative approach, emphasizing horizontal relationships between tutors and students. Hierarchy is deeply embedded in Romanian design studio culture. For instance, the Romanian term for a 'feedback session' is 'corectură,' implying that an infallible master figure (the tutor) steps into the studio to 'correct' their students' projects, inherently assuming the presence of errors.

- transparency concerning the allocation of resources, transparency including funding sources, interests, and power dynamics. This implies that students not only grasp the material and economic aspects of architectural production but also empower them to access the means of architectural production.

- ethics should be an integral part of the design process, involving not only the interaction between tutors and students but also extending to the end users. In this manner, all stakeholders should practice what they advocate for, aligning their actions with their ethical principles and expectations.

- advocating for a democratic design process in which ‘everybody designs’ and has an equal voice and role in shaping architectural solutions [24]. Placing emphasis on inclusivity, collaboration, and openness entails giving priority to a wide range of perspectives and actively involving a diverse spectrum of stakeholders in the design process. This approach ensures that design caters to the needs of the "radical other" [15], [25] rather than being self-centered. This approach makes the outcome of the design process more readily embraced, transforming it into a collective undertaking.

- a speculative and experimental studio culture: this implies encouraging speculative and experimental approaches that transcend disciplinary boundaries within the field of architecture.

- highlighting the harmonious integration of architectural designs with both the natural environment and human needs, as opposed to setting them in opposition, signifies designing in tandem with nature rather than in opposition to it.

- acknowledging responsibility for the future entails recognizing that each present decision carries implications for the future. Educating future professionals in the built environment becomes a crucial task if we aspire to built-up collective alternative futures that address sustainability goals.

These principles should guide non-hierarchical architectural pedagogies to foster alternative visions that align with sustainable and inclusive design practices.

## 4 CASE STUDY: THE PAVILION OF THE FESTIVAL OF ARCHITECTURE SCHOOLS OF TOMORROW (FAST)

The case study follows a series of workshops involving architectural teachers in university education (referred to as 'the tutors') and architecture students (referred to as 'the students'). These participants come from five different architecture schools in Romania (Cluj, Oradea, Bucharest, Iași, and Timișoara).

The theme of the pavilion project was connected to the six panels proposed at the UIA conference in Copenhagen in 2023. These panels addressed architecture and the built environment in relation to the 17 Sustainable Development Goals (SDGs). The six areas of focus included design for climate adaptation, rethinking resources, resilient communities, health,

inclusivity, and partnership for change [6]. This project was initiated by the professional organization known as The National Order of Romanian Architects and was part of the inaugural edition of the Festival of Architecture Schools of Tomorrow (FAST). FAST was conceived to shift higher education in architecture towards a greater emphasis on sustainability issues.

The series of workshops were divided into four phases: (I) weekly online meetings with tutors to develop the design brief (May - July 2023); (II) a hands-on workshop with tutors and students for designing the pavilion (one week in July 2023); (III) a series of online meetings with tutors and students to refine the design and assess the required materials for the proposed solutions (August-September 2023) and (IV) a construction workshop for building the pavilion, involving tutors, students, future users, and collaborators (ten days in September 2023).

The creative process for materializing the pavilion utilized co-designing and co-making [26] methods. These methods were employed to create an artifact that addressed the six panels, each envisioning the role of design in various SDGs [6]. This endeavor raises questions related to architectural pedagogy, design for sustainability transitions, and the role of design educators in co-creating methods suited for tackling the current complex challenges. Linked with these thoughts, we are arguing that this new architectural pedagogy should be aware of its role to create the condition for students to be educated in a culture of responsibility for collective alternative sustainability futures.

The series of workshops developed for constructing the FAST pavilion serves as an experimental case study, distinct from a traditional academic course or design studio. Its purpose is to observe and analyze how various actors within architectural education, such as tutors, students, and even non-human elements like models, the site, respond to changes in the process of designing an architectural installation, all while adhering to concrete sustainability goals (the SDGs).

The preliminary stage of the design process, which entailed the collaborative development of the project brief with tutors, was a comprehensive effort spanning over six weeks. During this phase, students were not actively engaged, as the tutors sought to establish a coherent strategy for the pavilion's co-planning. While this may be perceived as a means to enhance efficiency, it could be considered a drawback in the co-design process, as it inadvertently gives rise to hierarchical power dynamics (i.e., tutors possessing greater knowledge and making unilateral decisions regarding the students' tasks). The brief revolved around several key considerations:

Resource Efficiency: if one of the UIA panels focuses on designing with minimal resources, why create another pavilion that might merely become another aesthetic experiment, potentially wasting materials? To address this, the tutors issued a call to reuse recycled materials from other art installations in the city, particularly abundant since Timișoara was the European Capital of Culture in 2023.

Inclusivity: To relate the pavilion to the inclusiveness theme of UIA motto 'leave no one behind,' the design needed to be sensitive to diverse users and their needs. This included not only ensuring accessibility for disabled individuals but also considering the pavilion's usability by more-than-human actors, such as plants, animals, water, and snow.

Climate Adaptation: Adapting the design of the pavilion to climate change involves considering extreme weather conditions like heat waves and heavy rainfall which can happen in Timisoara.

Partnerships for Change: Perhaps the most crucial point in the brief was the need to foster partnerships for change. This idea led to the creation of mixed teams comprising tutors and students from the five architecture schools. This approach aimed to test collaboration, encourage diverse perspectives, and promote "dialogic collaborations" by rediscovering the power of collective action in design [24], [27].

The second phase of pavilion design involved tutors and students working together in a series of workshops, organized into several steps:

Getting acquainted: participants got to know each other; team formation: five mixed teams were created based on common interests and

themes related to the six panels; collaborative design: teams collaborated to design a pavilion consisting of five modules interconnected by a circulation platform;

The author of this paper also served as the tutor responsible for creating several hands-on tools to facilitate the formation of mixed groups, emphasizing the importance of including students and tutors from different university centers. It was met with mixed enthusiasm from both students and tutors, reflecting a fear of collaboration deeply rooted in the field of design education. This hesitation is connected to the traditional view of design that prioritizes individualistic approaches, working in isolation from affected communities, and maintaining a distant perspective on the project site. However, such an attitude contradicts the openness required for designing artifacts in collaboration with others.

To kick start the process, students were tasked with creating statements in the form of hashtags that summarized their perspectives on the six UIA panels. Over 20 hashtags were then grouped by tutors into five broader themes: #social, #techne, #climate, #sensorial, and #meditation, each corresponding to a future module of the pavilion. Students and tutors expressed their preferences to join one of these five themes based on their interests.

In the third phase, both tutors and students collaborated in five teams to meticulously develop and enhance the pavilion's design, aligning it with the allocated budget and the practical feasibility of hands-on construction. An essential element of this phase was the accessibility of the budget to both students and tutors, ensuring transparency and a horizontal approach. During this process, students gained insights into the fact that the design process is highly contingent and subject to various constraints, including finance.

The fourth phase involved the physical construction of the pavilion modules based on the designs formulated in the previous phase. This phase of co-making emphasized relationality, involving active engagement with materials and tools. It fostered a culture of collaborative efforts and the shared experience of working together.

The resulting modules, with their respective themes, and the pavilion as a whole should be regarded as a 'live project,' in which the complexities of the real world have been simplified for the sake of the exercise. Thus, the students and their tutors didn't, in essence, save the planet with this workshop, but rather, they experimented with a method of design and construction that can be further refined at future editions of the festival. This method tested a horizontal relationality between students and tutors.

Fig. 1: Overview of the FAST Pavilion with the #techne and #sensorial modules in the foreplan. Photo David Dumitrescu

Fig. 2 #Climate module of the pavilion. Photo David Dumitrescu

Fig. 3 #Social module of the pavilion. Photo David Dumitrescu

## 5 CONCLUSIONS

The paper explores the adaptability of architectural pedagogies in the context of educating architects who are conscious of their role and responsibility in envisioning, designing, and constructing futures aligned with the Sustainable Development Goals (SDGs). As observed earlier in the paper, even the very notion of the 'future' is manipulated by dominant forces: the future is preconceived as 'smart,' innovative, and inherently 'green.' In contrast, alternative visions for sustainable futures, which emerge collaboratively from the grassroots, involving individuals and communities, stand as a counterpart to the one-sided futures that are being sold by smart, innovative, and green corporations. It's the distinction between futures designed for the elite and futures that are collaboratively shaped by the broader community, ensuring that no one is excluded or left behind. The architect is involved in the issue, as the role of a visionary agent can be manipulated, beginning with their education. For instance, there is a prevailing narrative that universities should produce employees rather than nurturing critical thinkers. By examining a case study in Romania, which involved five architecture schools in a live project focused on designing a pavilion, we sought to address our research question: how can we educate architects not only as proficient technicians but also as facilitators capable of engaging with user communities and actively contributing to the development of alternative sustainability visions?

We introduced a non-hierarchical architectural pedagogy founded on horizontal interaction among stakeholders, transparency concerning the material aspects of architectural production, ethical conduct in engagements with others, a democratic and open design process rooted in speculation and experimentation, the seamless incorporation of outcomes into the environment, and a recognition of responsibility for the future. The case study unveiled that transitioning from a 'big-ego design' paradigm to an 'everybody designs' approach is challenging because hierarchy is deeply ingrained in both practice and architectural education. However, experiments with live projects can facilitate this transition through the social interactions occurring in settings that closely resemble real-life situations.

In architectural education, there has been a longstanding adherence to Vitruvius' triad and Le Corbusier's definition of architecture. Consequently, the recent emphasis on sustainability represents a relatively new aspect for architects. Today, architectural volumes should fulfill not only the traditional criteria of functionality, structural integrity, and beauty under the light, but also contribute positively to the planet, with an aspiration to be 'regenerative' whenever feasible. This presents a contradiction between what students are traditionally taught in their courses and what the Sustainable Development Goals demand of them. Thus, there is a pressing need to bridge the gap between theoretical curricula and the practical application of sustainability principles in design studios. Non-hierarchical architectural pedagogies can gradually cultivate an environment where future architects become more actively engaged in society, evolving into facilitators who are keen to learn alongside the communities they collaborate with. This collaborative effort aims to construct alternative sustainability visions that include, rather than marginalize.

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# Mosaic - Mapei Colours Competition

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**ABSTRACT**
“Mapei Colours Competition" is one of the many non-formal education projects and activities organized by the Faculty of Architecture and Urban Planning from Timisoara (FAUT), activities that involve both teaching staff and students from the faculty as well as external partners, with the aim of developing skills related to the field of architecture and interior design.
Part of the extracurricular activities, the "Mapei Colours Competition" is a mosaic work competition, organized in partnership with an important representative of the business environment - the Mapei Romania company, a competition with prizes, intended to stimulate the creativity of students of the first and second years at FAUT, specializing in Furniture and Interior Design, also aiming at the development of manual skills, visual and verbal communication.
Between July 10-19, 2023, the third edition of the contest took place. Each student had to create a representative study notebook for the concept. Then, in one of the FAUT workshops with direct access to the courtyard, under the coordination of six teaching staff from the faculty, each student developed a 60 x 60 cm mosaic painting, using adhesives and coloured grouts for ceramic tiles provided by Mapei. This year's theme, "100 years of the UPT Campus - urban mosaic", was transposed by the students into various intervention ideas on the terraces in the faculty courtyard and in the physical creation of a 1 to 1 scale sample of the ensemble. During the elaboration of the works, the students applied notions learned in the subjects of the faculty in the 1st year (Drawing Representation, Interior Architecture Composition Theory, Design, Building Materials), and the 2nd year (Interior design, The Study of Forms, Stylistics, Ambient Finishes). For those from the 1st year, the difference in knowledge assimilated in the faculty compared to those from the 2nd year was not a disadvantage but a prior experimentation, guided by the didactic staff, of some skills that will be strengthened later, a fact confirmed by the prizes awarded. The works were exhibited in the Central Hall of the UPT Library and verbally supported by the authors at the opening of the exhibition.

**Keywords:** design, extracurricular activities, mosaic work, student competition, visual communication

## 1 INTRODUCTION

Mosaic is an artistic genre with a history of over 5000 years. Appeared in Mesopotamia, then practiced with great skill by the Greeks and Romans, the mosaic generally belongs to the monumental arts, usually covering large areas of the floors and walls and even art pieces. Although apparently the mosaic is associated with the classical period of fine and decorative arts, it was reiterated in the modern and contemporary period, even in some avant-garde moments [1]. However, the field of interior design is the place where the mosaic manifests itself with great vivacity, in multiple forms of manifestation. Modern mosaic art has evolved over the years, incorporating new techniques, materials, and styles. This practice is characterized by its diversity, adaptability, and willingness to push artistic boundaries. Artists continue to innovate and find new ways to express themselves through this ancient art form.

“Mapei Colours Competition" is one of the many non-formal education projects and activities organized by the Faculty of Architecture and Urbanism from Timisoara, activities that involve both teaching staff and students from the faculty as well as external partners, with the aim of developing skills related to the field of architecture and interior design.

As part of the extracurricular activities, the "Mapei Colours Competition" is a mosaic workshop, organized in partnership with an important representative of the business environment - the Mapei Romania company, a competition with prizes, intended to stimulate the creativity of students of the first and second years at FAUT, specializing in Furniture and Interior Design, also aiming at the development of manual skills, visual and verbal communication.

## 2 THE PURPOSE OF THE WORKSHOP AND IT’S CONNECTION WITH DIFFERENT SUBJECTS

One of the main goals of the workshop-competition is the development of manual skills, at a time when they have been inhibited by often excessive digitization [2]. Regarding the impact of digital technology, there are several points of view. On the one hand, there are supporters of the implementation in all stages of the design process, who consider this to be a viable solution [2]. Although initially this approach had broad support, based also on the novelty of the technology, this method becomes more nuanced along the way due to some limitations that have been identified during the transition. Distancing ourselves from radical points of view [3], which considers that "The technology that was supposed to make young adults more astute, diversify their tastes, and improve their verbal skills has had the opposite effect. " More nuanced directions were identified that certify the importance of some processes carried out in the real environment.

Despite numerous advantages of CAD, school students apparently appreciate the experience of traditional drafting. There is perceived value of such learning in terms of transferable skills, personal achievement, and enjoyment [4]. Although current conventional CAD tools are advantageous for detailed engineering design, they do hinder novice designers' creativity [5]. This is due to their intuitive ideation limitation.

Another observed problem concerns the sketches made during the work. The students made a limited number of small sketches, preferring the digital environment for study. The presentation drawings, even if they were made by hand, do not have the character of an exploratory sketch. The phenomenon of Sketch inhibition has recently started to be studied [6].

Curriculum correlation: The validation of the knowledge acquired in the faculty through an applicative exercise, in a technique not experienced until now, has a more intuitive character. This is due to the fact that during the elaboration of the projects the students had to apply concepts acquired during the first year of study (Drawing Representation, Interior Architecture Composition Theory, Design, Building Materials), and second year of study (Interior design, The Study of Forms, Stylistics, Ambient Finishes) in a selective manner, which is actually related to the specifics of the theme and the realization technique.

The conscious or intuitive application of the principles of composition learned during the faculty, of notions related to color, chromatic contrasts, juxtaposition technique, graining,

dimensional variation, texture is done within this exercise on a 1:1 scale, working not only on a project on paper or 3D model on computer, but on the object itself as the final product.

Creativity, attention to details, but also efficient time management are general abilities stimulated and developed through this experiment in which the real perception of materiality, together with the use of tools and materials specific to the technique aim to lead not only to the acquisition of technical skills of the mosaic, but of craftsmanship in general. At the same time, in the long term, during the professional development experimenting with the mosaic technique aims to gain a broader vision and focus on the specifics of the technique with more expertise in supervising the execution on construction sites, as well as opening towards techniques less used lately, and possibly bringing them up to date in an innovative way.

Generating the work in an alternative way, swinging between pre-definition in the sense of working according to a predetermined plan and the achievement of finality following the intervention of randomness, of local or complete change during the physical evolution support the idea of an OPEN PROJECT. The changes that appear due to the initial lack of intuition of the limitations given by the technique, the absence of some colors etc., teach the student that the project must not remain "stiff", but adaptable, perfectible, etc.

## 3 THEMES OF THE WORKSHOPS

So far three editions were organised. The debut was in 2019, in which the students had total freedom in choosing the theme, the only restrictions were those related to the size of the work support, the maximal dimension of the mosaic pieces (called tesserae) and the use of as many different colours of grout as possible. Initially there was an attempt to arrange the works in a certain order using a grid consisting of 5x5 works, which implies a vertical and horizontal connection chromatically or formally with the works of colleagues. Along the way this requirement was dropped because of the increased complexity and the difficulty in organizing and coordinating the students among themselves, each having clear ideas of what they want to achieve and a different work rhythm. The results of this first edition were extremely varied, resulting in mosaic compositions with various themes, each interesting separately, but having a lack of unity as a perception of an exhibition in general (see Fig. 1 and Fig. 2).

Fig. 2 First edition 2019, during the workshop. *

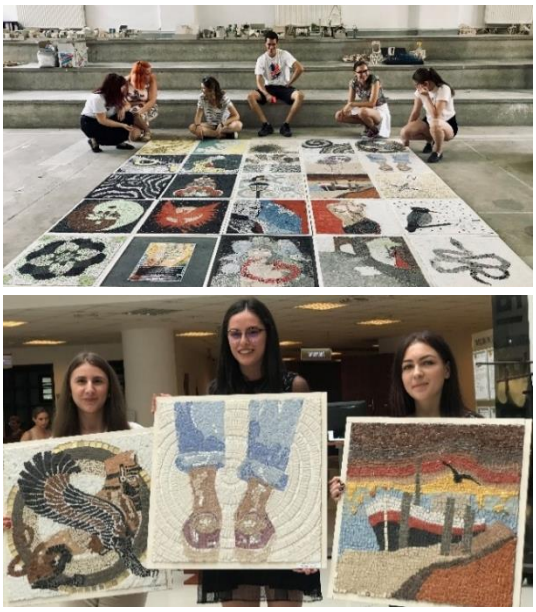

Fig. 2 First edition 2019, results and the winning projects*

Following this first experiment, we resumed the organization of this competition after the pandemic in 2022. Considering the previous feedback, we imposed a general theme, quite broad, but which created a kind of unity in the approach of the works by the students. The theme of 2022 was "Micro Universe - details seen under the magnifying glass". We observed the evolution of each student starting from the idea to the final project as seen in Fig. 3, 4 and 5.

Fig. 3 Second edition 2022, during the workshop. *

Fig. 4 Second edition 2022, the evolution of one project. *

Fig. 5 Second edition 2022, results and winning projects. *

Between July 10-19, 2023, the 3rd edition of the contest took place. The topic was narrowed down a lot, following a connection with the events that take place this year in the UPT University Campus under the auspices of “Creative Campus”. Within this exercise the creation of concepts that can be later implemented was pursued, the chosen location being the steps in the faculty yard (as seen in Fig. 6). This year's theme, "100 years of the UPT Campus - urban mosaic", was transposed by the students into various intervention ideas on the steps in the faculty courtyard and in the physical creation of a full-scale sample of the ensemble.

Experimenting with the idea of the open composition concept was most strongly stimulated in the 3rd edition, when, through the theme's requirements, the students had to create a fragment of a larger whole.

Fig. 6 Third edition 2023, location of the intervention. *

## 4 THE PROCESS

Creating a mosaic work involves the use of a series of operations and can generally be done by two different methods: the direct method (gluing the pieces directly on the final support), the indirect method (making the mosaic on a temporary, separate support, followed by its transfer to final support). Due to the fact that the dimensions of the mosaic paintings are relatively small and the work can be easily managed, the direct method was chosen, the mosaic pieces being initially placed on the support and then glued with the specific mortar, directly on the OSB support previously treated. After fixing the parts on the support, the joints were grouted, which, in addition to ensuring rigidity, generates the final appearance through the chromaticity chosen for the grout, and at the end the work was completely cleaned.

This year, the students had to create a representative study, in response to the assigned theme. Using one of the FAUT workshop ateliers with direct access to the courtyard, under the coordination of six teaching staff from the faculty, each student developed a 60 x 60 cm mosaic painting, using adhesives and coloured grouts for ceramic tiles provided by the partner company - Mapei. This year's theme, "100 years of the UPT Campus - urban mosaic", was transposed by the students in various ideas of intervention on the steps of the courtyard of the faculty and in the physical creation of a 1 to 1 scale sample of the ensemble.

All materials (ceramic tiles, adhesive mortar, grouts, cleaning liquid), OSB supports, tools and protective equipment used were provided by Mapei. The partner company imposed only 2 aspects on the participants, namely: the small size of the mosaic pieces resulting from the cutting of ceramic tiles (maximum 2 cm in 1 or 2 directions resulting most diverse shapes) and the use of grouts in varied colors. The organizing coordinator teachers imposed on the competitors the size of the support of the works (60x60cm), the theme and the location of the intervention.

In addition to the competition theme, on the first day of activity there was a presentation of the mosaic technique done by the partners, the characteristics of the materials and the appropriate use of the tools (as seen in Fig. 7). Before starting the actual activity, the mandatory work protection briefing was made, along with the presentation of the personal safety equipment (equipment protective glasses, gloves, etc.). At the same time, the space where the workshops took place allowed good ventilation, because the students had to work with specific adhesives and grout.

This year, each student had to create, in addition to the previous editions, a representative study notebook for each one's concept, in response to the assigned topic, and only then moving on to the actual realization of the proposed mosaic paintings (as seen in Fig. 8, Fig.9 and Fig.10). This year, as an exception, we had two third places, due to the impossibility of the jury members to choose a winner, a fact that denotes the exceptional qualities of the resulting works.

Fig. 7 First day activities from the third edition, 2023*

Fig. 8 During working on the third edition from 2023, details of the mosaic tiles/ tesserae*

Fig. 10 Results from the 3rd edition 2023, winning projects. *

Fig. 9 Notebooks, sketches from the third edition, 2023*

## 5 OBSERVATIONS DURING THE CORRECTIONS

Every day during the practice/competition, the students had 2 corrections per day assisted by the coordinators. The students manifested an increased interest in as many discussions as possible, for a more directed and efficient evolution to achieve one of the goals (winning the prize). The diversity of the coordinators, of their personal approach and opinions presented a challenge for a young student.

The coordinators only guide, the idea, general concept remains that of the students.

What might seem like a limitation - losing the initial idea sometimes - can actually be a plus! The freedom to completely change the vision, as the work evolved, made the students easily overcome the reluctance to change.

Although they were given a preliminary demonstration, the students learned and understood best through direct experimentation of the technique of putting the materials to work, the necessary concentrations and the specific hardening or drying times. Failure to respect the limited time for modification, adaptation or cleaning of the adhesive and the grout has sometimes generated syncope.

## 6 RESULTS ANALYSIS. JUDGING THE COMPETITION

The evaluation criteria, at each of the 3 editions of the mosaic contest, were the following:

- The composition and its complexity,
- Respecting the subject data,
- The ability to generate a concept and to transpose it into work,
- Technique and Accuracy of execution.

Each time, Mapei - our partner, left it up to the coordinating teachers to make a ranking of the works and asked them to indicate the best 5. Of these 5 selected works, the representatives of the Mapei company had the freedom to choose three, to whom they awarded prizes.

Judging was always difficult, due to the great variety of works. At the same time, the prior training of the 4 members of the jury (2 - artistic versus 2 more technical) provoked a sustained debate between them, but the result was always a balanced one because all 4 criteria were evaluated summatively. Some works that were highly appreciated due to the very high level of artistic expressiveness lost points due to small deficiencies either in respecting the theme data or in terms of technique. Others, very carefully made, were de-pointed due to a vague concept or a lower level of compositional complexity.

At the last edition, where each work had to represent a fragment of a large ensemble that would completely cover the stairs/ terraces in the FAUT courtyard, an additional criterion consisted in the intervention method expected for the ensemble. The way in which an individual proposal would have the potential to generate broad compositional paths, variety, and conceptual coherence of the intended monumental work of art, as it emerged from the sketches in the study notebook, attracted the awarding of additional points, at the expense of those who proposed either an excessive filling of the terraces, or a composition based on the uniform repetition of the pattern. The work to which Mapei awarded 1st place fits very well in this additional criterion, without neglecting the other 4 criteria either.

## 7 STUDENTS' FEEDBACK

The students made personal observations during the generation of the works, upon their completion, but best of all, the feedback was synthesized after the practical colloquium, where each student had to describe his own experience. Students can choose to participate in the "Mapei Colours Competition" as a practice activity, and many of them opt for it, every time it takes place.

To the question "What would they change", the answers were the following:

- They would prefer to work in a team.
- To have more colours available, and they should be distributed fairly, to the detriment of the "first come/served law" and they want this to be managed by the coordinating teachers.
- The size of 60x60 cm seemed too big to some. The size influences the execution time on, and it is possible that the relatively large size may be the problem.
- Loss of interest due to working too much can be reduced by introducing working in teams.

Besides the idea itself of creating a mosaic, there are other things that the students appreciated positively:

- The fact that there are prizes attracts them!

- It is immediately after the end of the exam session; they stay together in a kind of vacation where the workshop seems like an active rest.
- It is summer, and the venue - the workshop-club from the faculty has a direct access to the shaded courtyard and the amphitheater outside.
- They can stay in the faculty working longer, the program is flexible, only the final deadline is imposed.
- The relaxed, informal atmosphere, they play music, they leave and come back when they want, they can eat in the meantime, they don't have to wait for a break.
- Creative character.
- They liked to break the tiles to obtain the *tesserae* (as seen in Fig. 11). For some, doing repetitive "work" of limited intensity calms them down. Physical work itself calms people with intense intellectual activity. The joy of (small) destruction reduces stress [7].

Fig. 11 "Breaking the tiles" from different editions. *

## 8 EVOLUTION. LIMITATIONS. IMPROVEMENT PROPOSALS

By comparison with the 1st and 2nd editions, the last one represented an evolution in terms of the level of complexity, both through the specifics of the imposed theme and through its applicability in a real (hypothetical) context.

In the third edition of the contest, the realization of a fragment of a hypothetical larger ensemble represented a limitation in the sense of the impossibility of simulating or fully intuiting the final result. Making only one part of the whole concept, some tend to clone it repetitively - identically, as it results from some notebook sketches made at the beginning.

Since until now the students have made sketches only at the beginning, in the future we foresee resuming the overall sketches after finishing the work, something that will reflect the manner of adaptation or improvement of the initial idea, at the end. At the same time, the necessary teamwork for the actual completion of a large-scale work was only a simulation. The loss of initial enthusiasm was generally due to poor execution which was often the cause of struggling with limited time. The introduction of teamwork in the next edition could remedy these shortcomings. The connection with the Practical Work subject (the possibility of assimilating the mosaic competition as a subject of the practice activity) which, through the discipline sheet, implies the obligation to hold the colloquium is a good thing, because holding the colloquium in front of the class of students and the coordinating teachers reflects real feedback. It's good that it's part of the Practical Work because sharing their own experience, initial expectations, possible frustrations, evolution, as well as their answers to the question about what they would change in the course of the workshop in the future represents valuable feedback regarding the evolution of the exercise.

Possible accidents (breaking ceramic pieces can generate sharp shards, pliers can pinch, hammer can hit or crush), mainly due to non-compliance with labor protection rules, remain a problem, but keeping and reusing broken ceramic pieces left over from an edition on the other hand, it represents a reduction in the chances of injury and, at the same time, a chance to share them fairly between the teams.

## 9 CONCLUSIONS

For those from the 1st year, the difference in knowledge assimilated in the faculty compared to those from the 2nd year was not a disadvantage but a prior experimentation, guided by the didactic staff, of some skills that will be strengthened later, a fact confirmed by the prizes awarded.

The works were exhibited in the Central Hall of the UPT Library and verbally supported by the authors at the opening of the exhibition, a fact that led to the improvement of the students' abilities in terms of verbal communication, using language specific to the field of design.

The students gave proof of independence in choice and of the ability to discern individually; the fact that, during the revisions, the coordinators issued personal, different, and sometimes contradictory opinions, was helpful in achieving this skill. The limitation of the theme leads to the reduction of the figurative and the proliferation of the abstract character. The students thus reached a higher level of understanding of the creative process.

The imposition of the non-figurative through the theme would generate inhibition, especially for those less used to conveying abstract notions, which is why the "door" of the figurative remains open. The figurative can lead to more detailing and often to the pleasure of the achievement. The preference for the figurative is a natural tendency, even among those initiated in the visual arts. The fact that the partner (MAPEI) does not participate in the evaluation of the works chosen for the prizes, this being done by teaching staff who have knowledge of abstract arts, does not tilt the balance definitively towards the figurative. At the same time, the figurative cannot be "photographic", precisely because of the technique (fragmentary, the contours of the joints), more or less they reinterpret something existing in the real world, in a manner imposed by the production technique, thus resulting in images diminished in too naturalistic details. For some, it was precisely the attempt to transpose reality in the work as mimetic as possible that led to very successful details, attracting positive appreciation of the work.

The freedom to completely change the vision, as the work evolves, made the students easily overcome the reluctance to change. This represents a plus in the education of architecture and design students in terms of understanding the idea of an open project, which can always be perfected.

The fact that, at each edition of the Mapei Colors Competition it was very difficult for the jury made up of teaching staff to choose the top 5 from a number of 24-25 works, due to their generally high level of quality, proves that one of the goals main objectives of the workshop - the development of manual skills, at a time when they were inhibited by digitization - was achieved.

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# Architecture. Delights and caprices

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**ABSTRACT**

,,Architecture. Delights and caprices'' was the title of the exposition that brought together projects accomplished by 4th year students from Architecture and Urban Planning Faculty in Timisoara, at Anthropology seminar. Although very different, all seminar themes explored the relationship between place, perception and emotion, the way it can be revealed sequentially from urban to micro scale, analyzing the space rather from its anthropological charge than from its technical or strictly functional parameters. The actual challenge for students was to evaluate the space as it is seen from human beings and their needs, from their preferences and living patterns, carrying a cultural and a personal mark altogether. Identifying individuality and commonalities in everyday life and in artefacts. In fact, the seminar themes were a pretext to better understand the anthropological side of architecture, to explore personal experiences related to built space and to raise awareness on how space itself can modulate human perceptions, emotions or expectations. All exercises aimed to overpass the level of a simple visual answer, compelling a response concentrated on the perceptive, emotional or social side of experiencing spaces, being solved through various techniques: drawings, models, textile or graphic approaches. Regardless of used methods, the exercises served both a professional and a didactic scope. First of all, because this kind of exercises can play an important role for architects, in the whole process of professional growth, implying a consistent work of introspection and awareness of one's own spatial experience, preferences and values. And not at least, because the exercises deliberately deviated from conventional didactic methods, from imposed methods of solving, encouraging personal researches for the appropriate method of graphically expressing own solutions and conclusions. The exhibition at the end of the semester, was the result of a significant collective effort, presenting to an extended audience artefacts that not only comply to professional exigencies, but also witnesses anthropology as a valuable resource for architecture.

**Keywords:** anthropological architecture, education, profession, architectural education, research

## 1 INTRODUCTION

In an academic medium with such a diverse and complex information to access, filter and process, in a context of sometimes rigorous educational objectives and methods, architectural education has today a difficult mission to stimulate creativity process through inventive pedagogical methods that are not only helping to achieve educational goals, but are also becoming tools for actively involving students during the entire process. Benefiting from an anthropological-oriented course in an architectural academia, its associated seminar prioritized and displayed human subject in the forefront of pedagogical objectives, research, instruments and methods, while keeping architecture on the background.

,,Architecture. Delights and caprices'' was the title of the exposition that brought together projects accomplished by 4$^{th}$ year students from Architecture and Urban Planning Faculty in Timisoara, enrolled at Anthropology course and seminar. Although very different, all seminar themes explored the relationship between place, perception and emotion, the way it can be revealed sequentially from urban to micro scale, analyzing the space rather from its anthropological charge than from its technical or strictly functional parameters. The actual challenge for students was to evaluate the space and the spatial experience as it is seen from human beings and their needs, from their preferences and living patterns, carrying a cultural and a personal mark altogether [1]. Identifying individuality and commonalities in everyday life and in artefacts.

In fact, the seminar themes were a pretext to better understand the anthropological side of architecture, to explore personal experiences related to built space and to raise awareness on how space itself can modulate human perceptions, emotions or expectations. And the final expositions that put together all projects was a pretext to observe and analyze other perspectives and other approaches of the same theme, arousing empathic attitudes towards their colleagues.

Fig. 3 The board with excerpts from *Architecture. Delights and caprices* exposition

## 2 DELIGHTS AND CAPRICES

Why this title, *Delights and caprices*? Because these two words are somehow intriguing especially when associated with architecture, because they are suggestively expressing a twist of ludic character, even though we know we have to play, professionally speaking, a serious game. The truth is that in education, but not only in educational process, too serious can sometimes mean incomplete or omitting the fun part, that can open secret doors to creativity or to actively engaging into the process.

Delights and caprices can also be about passion, about instincts transcending the rational and the excessive functional part, about creativity and imagination in pure form. Can be about extravagances or unexpected wishes we usually restrain or set aside, because of some reasons not every time we are aware of.

The words can also be about exploring ourselves in terms of instincts or memories, about rediscovering small things we once liked or cherished, about rediscovering our senses or memories associated with our senses in the places we once lived or spent our time. All of these details, very important for our profession. And also, from a didactic point of view, these underneath layers of our life and personality are a real treasure to work with.

Fig. 2 Photos from *Architecture. Delights and caprices exposition*

## 3 THE THEMES

Keeping these didactic objectives in mind, for the delights of students (and for the delight of teacher, we can admit), at the seminar there were given 8 different themes that students could choose from. They had to submit 5 exercises from the 8 themes available, in a wide time- interval during the whole semester.

This was the first instrument to pass the responsibility into students' hands, to confer a sense a necessary control over pedagogical process. Having the freedom and also the responsibility of choosing what, when and how to work for this seminar gave students a sense of free-constraints effort.

The themes were vaguely formulated in terms of the results, while setting a coherent, yet flexible frame for the final products. The themes offered some clues about the objectives, opening wide doors to experiment, individual research, to inter and multidisciplinary information that can adequately blend into architectural theory and practice.


Fig. 3 Excerpts from the themes provided at the seminar

All themes were of course about architecture, but the actual processual challenge was to evaluate and appreciate architecture as a background, analyzing how architecture and space is seen from an anthropological view. So the individuals behind the final projects were half (future) architects and half simple space users, consuming architecture. This is another argument for the *delights* and *caprices* chosen for the title of the exposition.

Although very different, all themes explored the relationship between place, perception, emotion, as it can be revealed sequentially from urban scale [2] to micro scale, when we take a zoom in on a personal place.

Fig. 4 Excerpts from the results of Theme 1 and 2, *Sensorium urbanae*

First two themes, for example, evaluated an urban space upon its emotional and sensorial charge, resulting some sort of subjective mapping, defined on a sentiment-based connection with a specific environment, that captured different degrees of emotional or sensorial intensity.

The students choose to express this subjective map in a very diverse and captivating methods, using haptic materials, graphic or photographic pieces, creating different textures, choosing the techniques that could better represent and transmit a sensorial message.

The actual challenge behind all eight themes was to evaluate the space as it is seen from human beings and their needs, from their preferences and living patterns, carrying a cultural and a personal mark altogether [3]. How everyone is establishing its intimate, personal, social space and how the boundaries are perceived or established. And to see how all these patterns are establishing a specific relationship with its spatial context. In this way, these themes were in fact pretexts to better understand the anthropological side of architecture, to explore personal experiences related to built space and to raise awareness on how space itself can modulate human perceptions, emotions and expectations.

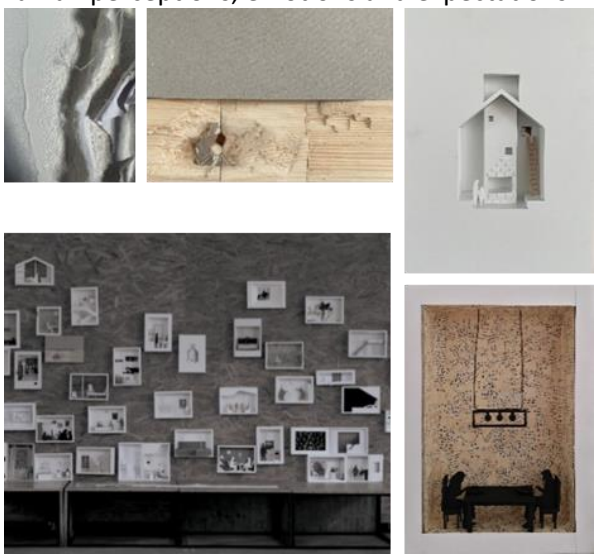

Fig. 5 Excerpts from the results of Theme 3, *Living together/apart*

The themes were about analyzing the urban or architectural space from its anthropological charge, not from technical or theoretical parameters, as we as architects are used to. The exercises aimed to overpass the level of a simple visual answer, compelling a response concentrated on the perceptive, emotional or social side of experiencing space. It resulted a collection or sequences of dwelling stories or dwelling frames, older or recent ones, sad or happy stories, explicit or more discrete tales, fragments of personal existence, or even childhood memories who marked first spatial experiences. A collection of things that is meaningful, preserving intimacy and richness for each student.

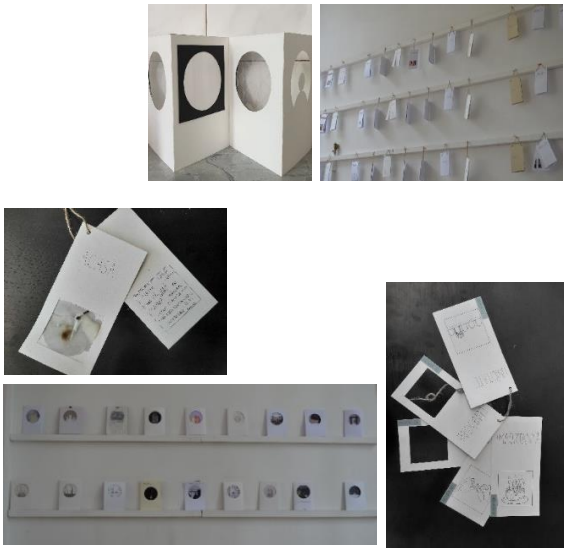

Fig. 6 Excerpts from the results of Theme 4, *Dwelling stories* and Theme 5, *Dwelling. Needs. Functions. Emotions*

It was an experiment on many levels, all of them delightful. When the personal living place became the focus of the exercises, it was the moment to identify the instruments that usually helps us appropriate the space, or mark us to become our territory, or the instruments that helps us to identify with a certain place.

Also, the students depicted a place or an object that they love and would take it away, depicted an object with sentimental value associated with our personal space. Or even fragments that are associated with any kind of emotional investments.

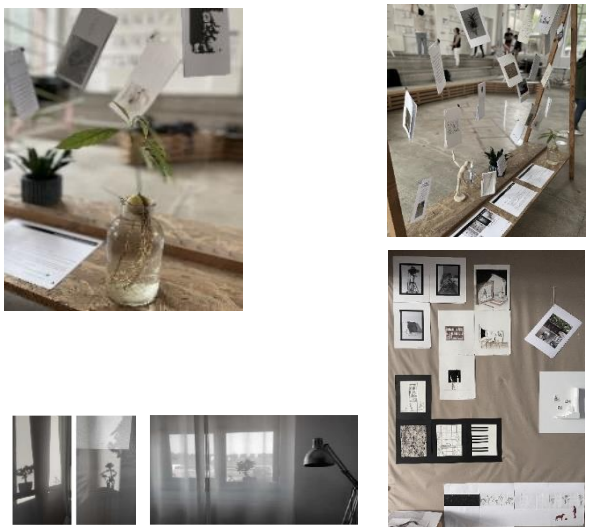

Fig. 7 Excerpts from the results of Theme 6, *At home. Falling in love with…* , Theme 7, *My personal living space* and Theme 8, *Sensing the space we live in. Zoom in. Zoom out*

## 4 THE PROCESS

From a didactical point of view, the final results are very important, but the process itself is also a key instrument that can regulate its outcomes. The challenge of this seminar was to permanently find suitable ways to keep the interest of the students, so that they are developing their personal projects, while still feeling a part of this large group, sharing ideas and collaborating in this final collective project.

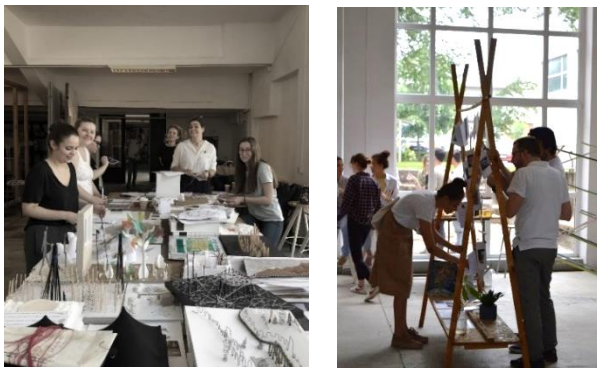

Fig. 8 Photos with students preparing the exhibition

All exercises during the semester served both a professional and a educational scope. First of all, because this type of exercises can play an important role in the whole process of professional growth and maturity, implying a consistent work of introspection and awareness of one's own experience and spatial values. And also because it was aimed an intentional detachment from conventional didactic methods, adapting the exercises to students' or themes' particularities and considerably relying on personal researches and endeavors. Also, leaving the door open for an experimental process. All these can implicitly mean a consistent personal involvement in the whole process, essential ingredients in didactic attainment.

Fig. 9 Photos with students preparing the exhibition

## 5 THE EXPOSITION

The process was important, but the final exposition was important as well. Because it gave students the chance to gather their work and to enjoy this collective effort, the chance to become empathetic or curious about other personal stories or other values that maybe they never thought about it. The exposition gave the chance to discover other personal values associated with space and architecture, to discover the richness of diversity and singularity put together in one place.


Fig. 10 Photos from the exhibition

## 6 THE VISITORS

Through the final exhibition, their work was also visible to everyone interested. Students made announcements and events on social media, so at the exposition came all kind of visitors, a lot of children, very curious about the models they saw, putting a lot of questions and choosing the preferred model in the exposition.

Fig. 11 Photos with the visitors of the exhibition

## 7 THE MADELEINES

The delices and caprices worked very fine with madeleines and the tea. Visitors wrote down a collection of childhood madeleines who marked their first spatial experiences, accompanied by their childhood their youth music (students put their childhood music and it was good music). Visitors were invited to soften a madeleine into a cup of tea and to write down on a piece of paper their own madeleine associated with space, simulating this way a synesthetic process we often do it in architecture projects.

Fig. 12 Photos with the sweet treats of the exhibition

## 8 CONCLUSIONS

Therefore, the second semester finalized with this atypical yet successful exposition, as a result of an impressive collective work, presenting to an extended audience projects that not only comply to professional exigence, but also witnesses the relation between architecture and human beings and the importance of educational process, with its all relational and didactic engagements.

So this initiative or experiment in architectural education was actually a sensorial exposition with a personal approach and a wonderful human experience, very far from a typical seminar.

This experiment confirmed that the results are far better when students themselves are motivated and decided to get involved, and that their involvement is also depending on the perception of the entire process and on the quality of the relation with the teacher.

And also, a very important conclusion is that from a students point of view, the quality of didactic process is evaluated upon its emotional charge. The emotional charge of a process is very much deciding its result and its final appreciation from the students. And architecture also applies this principle.

## 9 ACKNOWLEDGMENTS

I am thankful for the entire team of the students who made this exposition not only possible, but also a pleasant process.

All photos presented here are made by students or by teacher.

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# Feel the Detail.
# Perceived Barriers in Movement through Educational Spaces

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**ABSTRACT**
Exploring architectural space is primarily carried out through our eyes. Due to our sight, we develop an idea of the open paths and obstacles that facilitate or restrict movement, helping our brain to anticipate and establish routes. The environment is decoded based on prior encounters: starting points, paths and places of destination are compared to memories from our past experiences.
While moving, our perception is influenced by senses and gravity. Past experiences and personal preferences can also generate defense mechanisms and determine our choices. The variety of surfaces seen or touched, feelings of heat or cold, various perspectives, air currents, light and shadows, smells, relations between interior and exterior, inclination and distance, acoustics, all have the power to alter the way we interact with the built environment.
This research paper will discuss the methods and tools used for integrating inclusive design principles into architectural education through experiential activities held with the 4th year students from the Faculty of Interior Architecture, specialization Interior Architecture in the academic year 2022 – 2023.
Teams of students accompanied by a blind person and his guide dog were involved in observation tours of the UAUIM building, using white canes and opaque eye masks, antiphonic headphones, and earplugs, to explore their school with different senses. Each team was asked to follow three rules. The first ground rule was: *No one left behind*! The second condition was experiencing at least one disability for a minimum of ten minutes. The third one referred to being aware of barriers on the traveled routes, by sketching, photo-video documenting, measurements, and discussions inside each team. By following these guidelines, teams could gain a better understanding of the challenges faced by individuals with visual and auditory deficiencies.
Walking through well-known circulation spaces while experimenting with a visual or auditory disability involved much more than simply moving from point A to point B. Students concluded in their presentations after a week that they have felt various emotions and multisensory experiences. An interesting phenomenon occurred while investigating the educational spaces: synesthesia, an association of different sensations and a form of creativity that can stimulate cognitive processes and memory.
Details perceived as insignificant for normal vision people change into important clues or stressful barriers when navigating through space without the visual sense. Students presented accessibility analysis, emphasizing architectural and psychological barriers, emotions, and multisensory experiences.
Experiential teaching & learning activities embedded into architectural education have the power to radically transform students' perspective related to design approach by revealing unique insights and creating strong lasting memories.

**Keywords:** barriers, inclusive design, multisensorial experiences, exploratory learning, constructive details

## 1 INTRODUCTION

Space is constantly changing and moving. It is never a static view, like in a scale model or a visual sequence of photos from a professional architecture magazine. To perceive space, you need to decode it in movement. It requires more than just getting from point A to point B, as it is a multimodal experience that includes hearing, olfactory sense, tactile-kinesthetic perception, and emotions in addition to sight. A well-designed educational built environment will offer a variety of options, with more subtle or sudden transitions. Different moments in a day or during a season may influence the walking experiences through the architectural space. Not only the visual perspectives are changing, but the sensation of warmth or coolness, the wind blowing on a terrace, the sounds of the leaves rustling, or the rain dropping are changing as well. Small constructive details are making the difference in terms of accessibility: for a step riser, every millimeter counts; for a ramp, every degree counts; for a door, every centimeter of a threshold counts. Every little barrier can become an insurmountable obstacle for a visual or motor impaired person. Just as the opposite can be true: a well-thought detail matters. Not just seeing, but feeling the textures from the flooring, walls, and furniture and the ways in which sunlight, sound and air currents travel through the succession of spaces can help guide the paths and influence the overall experience. Proprioception, also known as kinesthesia, allows us to perceive the location, movement, and action of each of our bodies, becoming aware of the position and movement, muscular force, and effort.

Synesthesia, or the association of feelings is a form of creativity that can stimulate cognitive processes and memory. Some individuals can perceive certain colors when they hear certain sounds, or they can feel different tastes when associated with reading specific words. Our previous experiences have a lasting effect on how we perceive the environment [1]. People are beings that see themselves in the center of the surrounding world [2]. Particular childhood memories might lead to the development of defense mechanisms or the avoidance of some locations. Personal tastes may also influence the types of settings we favor or avoid.

For this reason, our paper also investigates possible answers to the following main questions:

- *How do our senses affect the way we perceive space and how can we use them to improve our learning?*
- *How does synesthesia manifest in students exploring the educational space?*
- *How can we get through these psychological obstacles and adopt an approachable and curious mindset towards the educational environment?*
- *How can we navigate the educational environment in a creative and engaged manner?*

## 2 METHODOLOGY

The design of inclusive architectural spaces means more than checking an accessibility list of legislative requirements [3]. Instead, inclusive architecture has a lot in common with the notion of *empathy* [4] or *getting in another person's shoes*: the way a person with disabilities moves through space and feels. For this reason, we strongly believe that observation tours and other methods of exploratory learning are vital for students, helping them experience architectural space from different perspectives [5, 6].

This paper will analyze the main exploratory activity integrated in the ST-101 *Sustainability and Technology in Interior Architecture*, a mandatory discipline initiated three academic years ago, for students in the 4$^{th}$ year, specialization Interior Architecture (IA), Faculty of Interior Architecture (FAI), UAUIM.

ST-101 involves 56 hours of lectures and seminars in the first semester and aims to cultivate an integrated approach to sustainable design in interior architecture. This includes both technical competences, as well as responsive skills towards environmental protection and users with diverse needs and abilities.

In the academic year 2022-2023, a two-hours lecture on inclusive design was held in November. The guest speakers were members of AMAIS (Association of Alternative Methods for Social Integration) [7]. In the following week, students participated in a four-hours seminar, where they experienced visual and hearing impairments using

opaque glasses, white canes, earplugs, and protective headphones. Eight student teams were formed in the DST.LAB (The Laboratory of Architectural Technology of the Department of Technical Sciences, UAUIM) through interactive playful activities. Considering the borrowed resources from AMAIS (8 foldable white canes with different heights and 8 opaque eye masques) we decided to work with exactly 8 teams of 6-7 students.

For creating teams in a short period without noisy and time-consuming negotiations among students, we proposed a role game experience. Eight students volunteered for the role of team leaders. They were asked to choose their teammates, one by one, in six rounds. This part was not an inclusive action intentionally and was given to students as a topic of exclusion, an emotional barrier to reflect upon, and discuss in their future presentations. After the teams were complete, all 8 leaders blindfolded chose a ball from a box, representing their team's mascot (Fig. 1), based only on their tactile sense. Afterwards, they distributed labels of their team's name for their colleagues.


Fig. 1 Eight teams of 4th year students formed by blindfolded choosing a ball based only on the tactile sense

Each leader was responsible for receiving and returning the equipment at the end of the day. The routes and the rules were presented to students, as illustrated in Table 1.

Following these organizing activities, students and teachers started from the ground floor, UAUIM exhibition spaces and entry hall.

There, we had the opportunity to listen to a very interesting presentation made by Paul Bogorin, a young blind professional from AMAIS (as shown in Fig. 2). Paul talked about his own experiences as a person with visual impairments and practically explained to students how to properly use a foldable white cane. He used his sense of humour to answer all the questions, offering important insights. For the guided tours, Paul and his trained guide dog, Phantom could only accompany one team of students. For selecting which one, Paul was also asked to choose one ball from the box (the teams' mascots). He got the tennis ball, so he accompanied the "Tennis Team" on their accessibility tour (of the UAUIM building). Of course, we donate the tennis ball to Phantom, to play with after doing his wonderful job as a day-to-day guide dog for Paul.

Table 1 Example of a working file for a 4-hours interior accessibility observation workshop with students

| Accessibility observation – guided tours – UAUIM<br>8 November 2022, 14:30 – 18:30 | |
|---|---|
| Participants: | 4th year students (two groups)<br>Interior Architecture specialization<br>Faculty of Interior Architecture, UAUIM |
| 14:30 – 15:00<br>DST.LAB<br>4th Floor, UAUIM | Organizing student teams and tour routes<br>8 team captains are choosing their teammates = exclusive role-playing game |
| 15:00 – 16:00<br>Ground floor exhibit space and entrance hall, UAUIM | Presentation: Movement in indoor spaces for visually impaired people<br>Guests: young blind professional with his trained guide dog |
| 16:00 – 18:00<br>Guided observation tours in UAUIM | Experiencing temporary disabilities: visual and auditory.<br>**Resources:**<br>• 8 foldable white canes + 8 opaque glasses<br>• antiphonic headphones + earplugs<br>**3 Rules:**<br>1. *One team – No one left behind!*<br>2. Everyone experiences at least one disability, for minimum 10 minutes<br>3. Team's Objective: awareness of the psychological, contextual, and architectural barriers encountered on the routes:<br>***ANNEX:** Suggested list of objectives*<br>Each team will define a specific route to reach 6 objectives: 3 mandatory objectives and 3 optional objectives, from a list of UAUIM spaces. |
| 18:00 – 18:30<br>DST.LAB, 4th Floor, UAUIM | Delivery of equipment.<br>Feedback.<br>Discussions regarding requirements for the accessibility analysis presentations: next week seminar, November 15, 2022 |

Fig. 2 Paul Bogorin and his guide dog, Phantom, presenting to 4th year students in FAI, IA, UAUIM, November 8, 2022

During observation tours (illustrated in Fig. 3), students had to be aware of the following components: access; orientation and signage; horizontal and vertical circulations (stairs, ramps, handrails, small level differences covered with three or more steps and elevators, doors' thresholds, corridors); acoustics; smells; natural and artificial lighting; materials (textures, colors, contrasts); use of spaces (furniture, displayed panels, scale models and other objects on the explored routes).

After a week, during the seminar, all eight teams presented their accessibility analysis of the explored routes (Fig. 4). Students emphasized architectural barriers, based on Romanian legislation [8] and inclusive design guides [9]. They also discussed multisensory sensations and psychological barriers (Fig. 5).

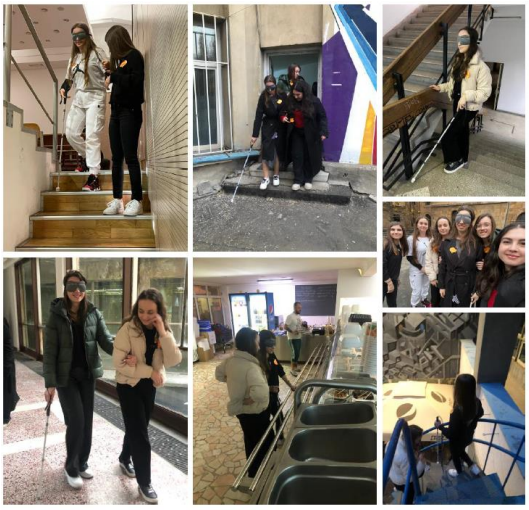

Fig. 3 Photos from the accessibility guided tours in the UAUIM building, the "Basket Team" made from six 4th year students in IA, FAI, UAUIM, November 8, 2022

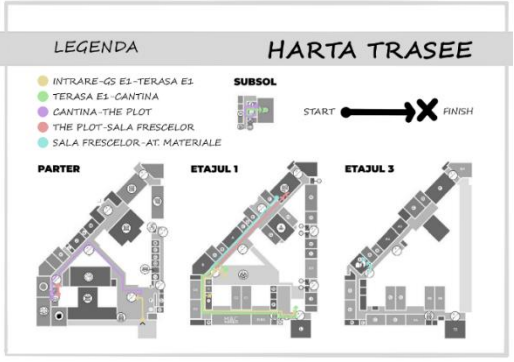


Fig. 4 The routes followed in the accessibility guided tours by the 4th year students from the "Tennis Team" marked on the plans of the UAUIM building

Fig. 5 Presentation of their accessibility analysis, made by 4th year students in IA, FAI, UAUIM, November 15, 2022

The following questions were addressed by students, aiming not to focus only on the technical, objective aspects, but also on the general experience and encountered barriers:

- *When did you feel left out? (Considering not only the traveled route, but also the process of team formation)*
- *What primary emotions did you feel? (joy / sadness / fear / anger)*
- *When, where and why did you feel safe?*
- *When, where and why did you feel exposed?*
- *How did you adapt to the traveled spaces?*

Following activities presented in this paper (and other practical applications related to sustainable design) students were tasked to create technical design proposals for interior refurbishment projects. These projects were developed until the end of the semester and involved existing areas of the UAUIM building. Height differences had to be resolved in an original and inclusive manner.

## 3 RESULTS

"I realized how important are all of my other senses, which seemed to be amplified when one of them disappeared". This student's statement underscores the remarkable adaptability of our

sensory system. When one sense is temporarily diminished, the others can compensate, providing a deeper understanding of our surroundings. The blind guided tours can be particularly enlightening for architecture students (as shown in Fig. 6), as a powerful reminder that architecture is a multi-sensory experience and should embrace all senses to create inclusive spaces.

Fig. 6 Students from the "Ping-pong Team" exploring textures, wall finishes from the corridors and exhibited objects from the UAUIM Museum, November 8, 2022

Students emphasized the importance of constant communication between the guide colleague and the temporary visually impaired person, which can build trust and save a lot of travelling time. For example, students pointed out the following: "considering that I always had a colleague to guide me, I felt safe"; "one thing that made this experience easier for me was the careful instructions given by the colleagues".

### 3.1 Auditory sensations

Hearing provided an alternative sensory pathway to understand and navigate architectural space, as suggestively illustrated in Fig. 7.

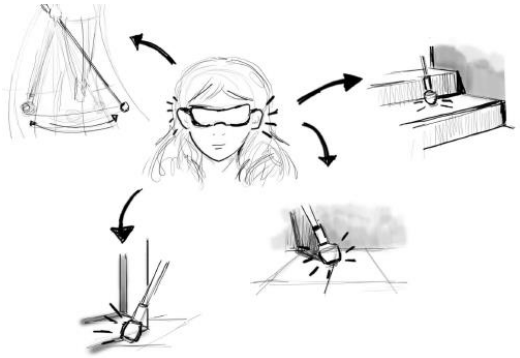

Fig. 7 Sketch presented by the "Șvaițer Team", IA, FAI, UAUIM, November 15, 2022

Students highlighted the following aspects:

- echo in wide spaces causes confusion (e.g.: the ground floor hall has only reflective surfaces);
- difficult orientation on the terrace (a vast space);
- easier to estimate the presence and distance of people on the corridors;
- doors recognition by emitted sound, different material from the wall plinth (when touched with the white cane);
- uncomfortable loud noises produced when moving on the metallic ramps (Fig. 8).

### 3.2 Olfactory sensations

Smells helped in recognizing proximity spaces or distinguishing interior spaces from exterior ones. For example, students perceived these smells:

- food from the canteen;
- fresh printed paper from the plot centers;
- disinfectant near the bathrooms;
- dry leaves from the interior courtyard;
- perfumes (of known and unknown persons).

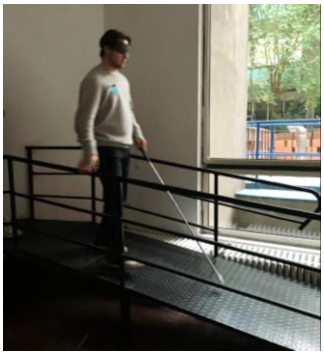

Fig. 8 Student from the "Golf Team" walking on a metallic ramp, UAUIM, November 8, 2022

### 3.3 Tactile sensations

Among the sensations generated by the sense of touch, students specified:

- carpets for the restrooms' and the terrace entries helped understanding the transitions;
- showcases or models exposed on tables were perceived as obstacles;
- uneven outdoor flooring for the first floor terrace;
- the height of the ramp's handrail was too low for people with visual impairments;
- the lack of handrails on both sides of a stair or a ramp;
- unmarked surfaces for low height radiators located on the corridors (this can cause injuries);

- the grills in front of the large glazed surface from the ground floor's hall helped while using the white canes, as shown in Fig. 9;
- the sensation generated by the dust after exploring the scale models that were exhibited on the corridors.

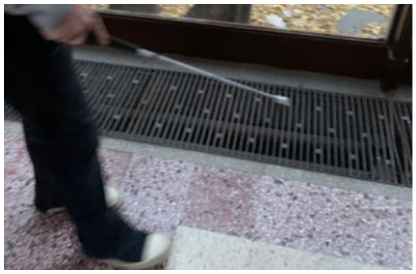

Fig. 9 Student from the "Golf Team" walking near a grill, guided by the white cane, UAUIM, November 8, 2022

### 3.4 Proprioceptive / Kinesthetic sensations

Travelling through space without seeing made students become aware of their bodies. It enabled them to explore architectural spaces safely. Students presented the following sensations:

- confusion & dizziness;
- anxiety & discomfort;
- sensation of falling into a void when going up and down the stairs;
- the constant sensation that something is coming in front of you;
- the sensation of "empty walking" outside, on the terrace, having almost no sound reflections (no audio benchmarks for guiding);
- the difficulty to estimate the proper speed of moving at the beginning;
- claustrophobia or the sensation of "pressure exerted by the walls in closed, tight spaces" like small halls or staircases;
- disorientation in the exterior space (terrace);
- the sensation of a labyrinth, instead of "a clear, organized space that inspires";
- known distances become longer, when using the opaque glasses and the white cane;
- the longer students explored a certain space or repeated a certain action (e.g., climbing steps), they started to get used to it, realizing that over a longer period of time "everything becomes instinctive"; "basically, that cane became an extension of your hand";
- learning & awareness: "initially I didn't believe that a well-known space could change its proportions and coherence when you can no longer perceive it visually"

### 3.5 Emotions and feelings of exclusion

The experience of walking without seeing or hearing (some students even tried to walk with both disabilities in the same time) in their own university activated a lot of feelings and emotions:

- *insecurity* and *lack of control* over space;
- *vulnerability* "since you cannot be fully aware of everything that happens around you";
- *frustration* and feelings of *marginalization* for not being able to hear the discussions between teammates or to read on their lips / constantly asking teammates to repeat loudly what they have said / not keeping up with the moving people around you;
- after a short period of quiet and relaxation when putting the earplugs and headphones, *silence* becomes an unpleasant, irritating feeling, as you "are able to hear your own organs";
- *insecurity* about what was happening behind, out of the visual field (e.g.: "when in high school, I always had a fear and insecurity about what could happen behind me"; "the fact that I couldn't see what was happening around me made me feel excluded and helpless in certain situations");
- *exclusion* when loosing contact with the guide or thinking about the possibility of being completely alone (e.g.: "I felt left out when I realized that if there wasn't a person to accompany me permanently, the chances of getting somewhere without knowing the space would be very small"); *exclusion* when people were talking about the colors of certain objects and about the visual appearance of the objects;
- *fear* of the unknown (e.g.: "while climbing the steps, another group of students could be heard around me; I felt panic and I stopped, thinking they will run into me or that I will hit them with my cane"; "I had the constant feeling there would be objects in front of me that I will not be able to anticipate and bump into them");
- *loneliness* and *helplessness;*
- *anger* (e.g.: "dominant at the beginning when the obstacles in front did not seem to end and I didn't know what was happening around me");
- *shame* (e.g., "when I heard a group of students and I felt like everyone was looking at me");

• *joy* (e.g., "when I succeeded to manage on my own and have a normal walking rhythm"; "we were happy and amazed by the kindness of the people who tried to help us");
• *safety,* when realizing "we were in a protected environment, and not on the street" (Fig. 10).

Fig. 10 A fourth year student from the "Șvaițer Team" is experimenting a temporary hearing disability during the accessibility tour, wearing ear plugs and headphones

## 4 DISCUSSIONS

### 4.1 Designing for dignity

"The way places are designed affects our ability to move, see, hear and communicate effectively" [10]. Most people do not pay attention to this matter until they are forced to deal in their everyday life with a form of permanent or temporary disability: themselves, a family member, a colleague, or a close friend. Furthermore, one component that architects postpone or seem to forget in the design process is consultation with their users. ''The objective is to gain a clear understanding of expectations as to how a building will need to function" [10].
For this reason, it is essential to listen [11], learn from, and constantly involve people with different disabilities in guided tours, in the design process and in the assessment of recently built projects. Keeping in mind that these persons' needs and experiences are not the same, but can also change according to age, gender, background, and various social contexts.

### 4.2 Opportunities:

Inclusive design should be a mandatory subject for an architect, urban planner, or an interior designer. Even if professionals working in designing the built environment will not be able to 100 % comprehend all possible barriers, we can always improve the design and the results by verifying and adapting different features.
Moreover, schools of architecture should stand as examples of good design, not only from the educational process point of view, but rather through the whole exploring experiences: building, site, and website. "The relationship of the university to its community is an essential component of a settings-based project. Does it sit there like a visiting spaceship with no relationship to its community, or is it an inherent part of its community and a resource to it?" [12].

### 4.3 Topics to improve:

With a few exceptions, there are many problems in the way spaces are configurated in the UAUIM building. Wandering through our university might be an adventure right from the start. At the entrance there is no map, nor a tactile scale model. Our website doesn't have any details regarding accessibility (and the route you need to know to get to your destination). For sure, its complexity resides in the additional building volumes to the existing historical building, which generated level differences. The economic aspect is another important issue. However, there are many examples of European universities facing similar problems and still being able to improve sustainable features and free-barrier access into their educational spaces.
In their book "Inclusive Design for Historic Building. Architectural Approaches to Accessibility", David Bonnett and Pauline Nee argue the need to make changes that do not alter the historic building's character and present a strategy that must deal with future additions / extensions, insertions, reorientation, and mechanization [10]. This collection of old and new layers embodies a "superimposed materiality" that generates the complexity of the architectural space [13].

## 5 CONCLUSIONS

Architects should not focus only on the shape of the designed spaces. Instead, their aim must be creating experiences.
The UAUIM building located in Bucharest's city center has the potential of becoming a landmark that demonstrates how architectural barriers can

be removed. Although it was built in different historical periods, according to various regulations, norms, and social contexts, it is possible to develop a sustainable rehabilitation vision to allow access for all.

Contemporary needs, respect for architectural heritage, inclusive design and the beauty of details are not mutually exclusive goals. They should all go hand in hand to create experiences that celebrate the past, enjoy the present and re-imagine the future.

## 6 ACKNOWLEDGMENTS

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# Construction and reuse - useful methods for architectural education

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**ABSTRACT**
In architecture education, because of its scale and complexity, it is difficult to model real-life situations, and it is easy to turn to mere theoretical approaches. At Debrecen, we have been experimenting for a long time with practical methods that show in a tangible way the whole process of the profession - from design to implementation - and at the same time address the important architectural problems of our time in a practical way. One of our priorities is the reuse of existing built assets. To focus on this, we organise projects that explore and present the hidden values and reserves of existing places - buildings, urban spaces - and reuse and transform them to serve new functional needs through small-scale interventions that can be implemented as part of a student project as well.
Our teaching approach originates from students' lack of familiarity with real materials. The projects launched after this realisation, in which students work with real materials, structures and methods used in architecture, have been very successful and have convinced us to continue and extend the experiments. After the real works, which were independent of architectural design, we tried to include the topic in the design courses as well using different methods. The active participation of students: the creation, leads to an approach that provides a much deeper and more conscious knowledge. This approach requires much more time, effort and resources on the part of the teachers and the department, but the pedagogical gains are clear.

**Keywords:** adaptive reuse, small scale intervention, hidden values, site-specific, sustainability

## 1 INTRODUCTION

The increasing complexity of architecture and the intensification of specialisation resulting from technological developments are posing serious challenges to architectural education. It is difficult to reconcile the requirements of legislation and the expectations of the profession and society. The ever-widening educational spectrum and the increasing number of subjects covered inevitably lead to a shift towards a more superficial, theoretical education. In order to counterbalance this, we have been experimenting in the architectural education in Debrecen for years, looking for good teaching methods. One important method is the project-based education, which has become increasingly common in architectural education. Beside this we also focus on practical projects where the architectural process can be experienced as complex as possible and which focus on contemporary professional issues. Our ongoing attempts to fine-tune education started from several directions, which are now clearly interlinked. [1]

## 2 REAL CREATION

One of our realisation started from the minimal connection of students with real materials and real structures. It is a cliché, but today's digital generation really has less and less practical experience. During our summer construction workshops, we noticed a gap between theoretical knowledge and practical experience, with minimal knowledge of building materials, construction tools and techniques in reality. This inspired one of our first pilot courses. In this creative design course, students created concrete objects, taking their work from design to realisation. The task was not only to create a free concept, but also to study all its real consequences, the structural and design conditions of its realisation and their repercussions on the design. In the process, we realised that, in addition to our initial objective of gaining a real understanding of the materials, the process from concept to construction decisions was in fact modelling a complete construction project. The success of the courses was clear, the attitude of the students towards materials and structures changed a lot, they became more aware of the specific building material - concrete - and more aware in general, which was also felt in the architectural design courses. [2] (see Fig. 1)

Fig. 1 Exhibition of the projects of the first concrete course

Thanks to our partners in the building industry, courses were also held with other materials - wood and cardboard, depending on the materials currently available - in addition to concrete. Despite this clearly positive experience, it has not yet been possible to offer the method to all students on a continuous basis, mainly due to the need for a substantial infrastructure, raw materials and teaching capacity.

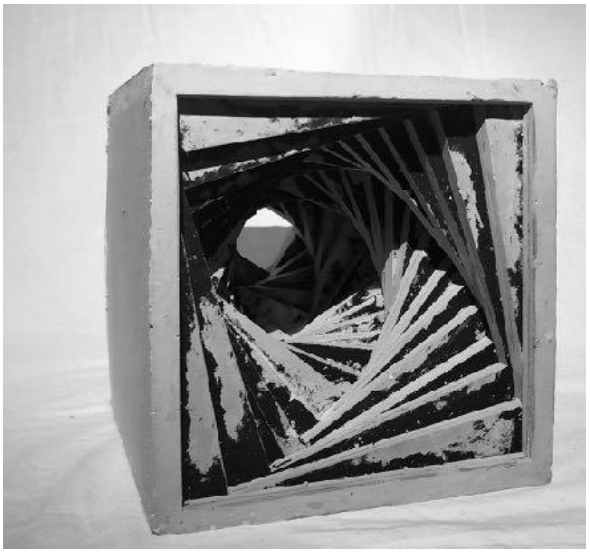

Fig. 2 First year students model by plaster

On a smaller scale, a similar method has been successfully integrated into the compulsory

courses. In the first semester of the bachelor's degree, the studio course, which introduces students to architectural design, focuses on basic architectural concepts and the study of space by creating a classroom and a home models each week. In one of these sessions, they have to create a 30x30 cm cube-sized model in plaster related to the topic of the class. Here again, the students' concept is influenced by the physical and construction constraints of the realisation, fortunately resulting in an interrelated and complex experience. (see Fig. 2)
It is difficult to reconcile the number of studios, the available infrastructure and teaching capacity, so we are trying to reconsider what is essentially for a successful exercise, so that all students can have a successful attempt and gain important experience.

## 3 COMPLEX COGNITION

Our second approach is also based on reality, but here it is already architectural design courses that are involved. Although the architectural design assignments have long been based on real locations, we started looking for even stronger connections. The first means of doing this has been to get to know the site, where the geometric survey is also carried out by the students, who decipher the layers and social details of the context using methods unique to the site, in addition to traditional tools. In many cases, the complex cognition itself is done through artworks, interventions, becoming an essential part of the design task. Courses typically do not deal with a semester-long design exercise, but rather explore a theme in smaller exercises.

Fig. 3 In-site intervention for deeper cognition

Learning through design is particularly emphasised in the one-week long project week in the spring semesters. One such course explored the possibilities of experiencing the residential environment. To do this, they implemented simple interventions that were able to go beyond the usual understanding of space. They explored everyday uses of the public spaces of the housing estates, such as playing on playgrounds, playing football and ping-pong on sports fields, or walking along paths in parks. By adding reflective surfaces, they transformed the environment of these activities and created unexpected perspectives and surprising situations of perception [3]. The aim was to give the participating students not only theoretical experience of the spatial potential of simple phenomena, but also experience of the potential of simple phenomena in real-world actions. (see Fig. 3)
This type of on-site cognitive processes: site-specific works, active performances, can help students' cognitive skills, but are obviously difficult to generalise and need to be reconsidered for each specific design site.

## 4 AWARENESS

After the methodological success of the approaches presented so far, which started as experiments, we have started to work more consciously with our existing environment, looking for architectural tasks for the students. We started to map, explore and examine our narrower - the

university environment - and wider - Debrecen and its surroundings - environment more intensively. Our objectives were several. We wanted to use the methods we had learned to consciously search for design sites, even with the involvement of students, and to bring them closer to conscious site search and complex cognition. We believe it is important to socialise architecture and to make our school and profession socially responsible. One of the tools of this approach is to make our environment known, to present its values and to raise awareness in society.

The various ways of incorporating creation and implementation in education have led us to realise that, in addition to design, the implementation of students' ideas can also be considered as an objective, as a small-scale intervention, of course, as we have already seen in previous approaches.

## 5 FIND A PLACE

After learning about the complex process of cognition, the idea was to extend it to place-finding, so that the intervention does not help to analyse the place already given, but to intuitively find the place itself.

This method was extremely useful during the online education phase of the coronavirus epidemic, when joint workshop exercises were not possible at all. The students had to find a site for a small-scale site-specific installation in the surroundings of their home. The search and the design of the intervention were carried out in parallel, helping each other, and could be understood as a kind of iteration, a gradual approach. (see Fig. 4)

Fig. 4 Landart intervention during online education

This type of method is only workable for a small course size where the teacher can still manage various different situations.

## 6 EMPHASIS

Place-finding intervention is a rather solitary genre, linked to the personal world of the creator. In contrast, more complex, open-ended themes are those where the aim is to present a place, to draw attention to it. Linked to this approach is the recognition that, with more and more stimuli coming at us, we tend to become more superficially aware of the world around us, and to miss its value. Uncovering these hidden values and potential development opportunities and presenting them to the public can be a specific objective.

There are many ways to explore a place in this way, to design and implement this type of intervention. The projects carried out included short group workshops and individual, semester long projects as well. They are closer to visual art in terms of their genre, but of course their strong link to and reflection on place is well understood.

The group, workshop-style implementation of the task allows for a larger scale intervention, but of course requires more infrastructure and resources, and is best suitable independently, outside of university time. [4][5] (see Fig. 5)

Fig. 5 Installation emphasizing the ruins of Talliándörögd church

In the case of the university curriculum version, it can be imagined more as a kind of student competition, where course participants compete against each other on the same topic, and one of the selected works can be realised. (see Fig. 6)

Fig. 6 Installation reflecting to a firewall made as a semester project

## 7 ARCHITECTURAL INTERVENTION

The interventions and installations created along a variety of approaches have increasingly pointed in the direction of setting a functional, architectural goal, thus no longer just modelling the construction project from design to implementation, but actually implementing it with student participation.

The pedagogical advantage was soon accompanied by another realisation: a thorough knowledge of existing sites, the exploration of their hidden values and reserves and the architectural response to them clearly fits in with the increasingly strong international trend of adaptive reuse. The projects thus succeed in presenting an important alternative to the issue of sustainability, an approach to which is not yet widespread in Hungary.

The uniqueness of the projects requires each approach to be unique, site-specific, with a wide range of student participation rates, timing and funding.

The first such project grew from a simple short project of a semester course. The students surveyed the faculty building, looking for unused, under-utilised spaces and proposed small-scale interventions, typically on a furniture scale. The presentation of the designs immediately convinced the faculty management to make use of the space reserves and implement some of the ideas. (see Fig. 7)

Fig. 7 Small scale interventions in the faculty building

The positive experience gave confidence to start similar projects. In the academic year 2023, at the request of a small village in the area, the students created a sanitary facility for a canoeing route on the banks of a river running next to the village, in the framework of a design course and a subsequent summer construction workshop. (see Fig. 8)

Fig. 8 Sanitary installation on the riverbank

On an even larger scale, the department's new creative atelier is being implemented in a similar way. An important industrial monument in the city will be revitalised on the basis of student designs, where the small building of 200 m2 will be renovated technically and small interventions will be made to make it fit for its new function. The scale of the intervention meant that student participation was only partial, but it was important to ensure that the work could be continued so that the architecture students who would work inside could continue to build on it as and when they needed it. [6] (see Fig. 9)

Fig. 9 The creative atelier under construction

Of course, the infrastructure, teaching staff and funding requirements for projects of this scale are even greater than for the previous ones, but because of their dual benefits - pedagogical and social - we are particularly concerned to be able to launch them as often as possible. The current higher education environment and university priorities are not particularly conducive to their realisation. For this reason, we also place great emphasis on involving external partners - companies, institutions and local government - to give us a better chance of implementing such programmes.

## 8 CONCLUSIONS

We do not, of course, aim to use all methods together in all cases, but we believe it is important that students should be able to encounter as many approaches as possible during their programme and to create as many as possible.

Generally speaking, whatever scale of approach they encounter, they will already have a practical approach and creative attitude in their minds that can successfully complement simple design tasks.

The integration of the approach into the curriculum is not without problems, we can carry them out typically in the context of independent, voluntary courses, workshops, summer camps. On the departmental side, the preparation, teaching capacity, resources and time required are considerable, but their use is constantly sought because of the clear positive results.

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# Inter-, Multi-, and Transdisciplinary education

# URBANISM + TOURISM: Educating Students through Urban Studio Projects in Golubac Town, the Iron Gates in Eastern Serbia

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## ABSTRACT

Tourism is one of hardly predictable albeit the fast-developing economic sectors today. This is also evident in Serbia, where one of the main new tourist routes is the Danube. The Iron Gates, as the longest European gorge on the river with specific nature and preserved cultural heritage and tradition, are particularly significant in these matters. The gorge is shared by Serbia and Romania. All localities in Serbian right riverside, completely remote just 10 years ago, have had the intensive tourism development last years.

Golubac, a town on the western edge of the gorge, has also had the fuelled rise of tourism due to the recent reconstruction of magnificent Golubac Fortress. However, this has opened many questions regarding sustainable urban development. Local government and experts in Golubac and team from the Faculty of Architecture in Belgrade have jointly tried to address the most triggering urban issues through three international projects: INTERREG DANUrB (2017-2019), DANUrB+ (2020-2022) and Erasmus+ CREATIVE DANUBE (2019-2022). The core of this cooperation was based on work with students, through urban 'planning + design' studios. Hence, more than 200 students have learnt about urban planning and design in tourism-driven urban environment.

This paper is the presentation of the results from this joint cooperation through higher education with Golubac Town. Its aim is to understand students' stance relating urban development and cultural tourism and how this combination has reflected through their visions, projects and chosen micro-locations for urban interventions. Nevertheless, this paper is not just a retrospective on the currently significant collection of student works for Golubac, but it also intends to form recommendations for the further development of education in tourism-driven urban development.

**Keywords:** Tourism, urban studio, urban programme, town development, Golubac

## 1 INTRODUCTION

Tourism has been one of the fast-developing economic sectors last decades. In 2019, tourism generated more than 10% of global GDP, employed approximately 10% of global working force and created more than ¼ new jobs worldwide [1]. Furthermore, tourism has also proven to be a very lucrative economic power for developing countries, generally improving their competiveness [2].

Within tourism, cultural tourism represents of one of those subsectors with fast development. The WTO data from 2015 shows that 40% of all tourist tours worldwide belong to cultural tourism [3]. Cultural tourism also posses many advantages comparing to other tourist sectors, such as not being conditioned by season and region. Practically, cultural tourism can be developed in any part of the World. Moreover, the character of cultural tourism as a 'consumer' or local cultural and creative activities has made it more innovative and proactive than other types of tourism [4].

On the other side, cultural tourism, as other tourist types, needs infrastructure aside of a core tourist attraction. Tourist infrastructure is very space- related and it includes accommodation, hospitality services, transport and travel, management offer, health care, cultural activities, retail, etc. This means that tourism in its wider sense touches the other economic sectors, such as a culture, transportation, trade or healthcare. All these sectors can not function without proper space. Thus, the development of cultural tourism and territorial development are strongly interlinked today [5]. This matters both physically and functionally. Ngamsomsuke at al (2011) underline that cultural tourists appreciate the attractive physical environment of cultural heritage sites [6]. Similarly, the mix of different activities and facilities in the locations of cultural tourism increase its attractiveness [7].

The previous conclusion implies importance to both plan and design places for cultural tourism to facilitate local tourist activities. However, learning and teaching activities regarding this are still pretty rare in higher education in urban studies. Hence, this was one of the main aims in three inter- connected international projects related to the Danube Region: INTERREG DANUrB (2017-2019), DANUrB+ (2020-2022) and Erasmus+ CREATIVE DANUBE (2019-2022). The focus of faculties-project partners, inter alia, was based on work with students, through urban 'planning + design' studios, to bring them closer to the proactive and sustainable planning and designing of locations with cultural sites along the Danube.

This paper is the presentation of the results from these learning and teaching activities centres on Golubac Town as a research and design area. The town is on the western entrance of the Iron Gates, the largest gorge in Europe on the Danube, which is the second longest European river (Fig. 1). The spotlight of the paper is to understand students' stance relating urban development and cultural tourism and how this combination has reflected through their visions, projects and chosen micro-locations for urban interventions. Nevertheless, this paper is not just a retrospective on the currently significant collection of student works for Golubac, but it also offers recommendations for the further development of education in tourism- driven urban development.


Fig. 1 The position of Golubac Town in the Iron Gates Gorge between Serbia and Romania (Author: B. Antonić)

## 2 METHODOLOGY

This paper is based on the statistical analysis of pool data; in this case, student works in urban 'planning + design' studios conducted on Golubac as a research and design area at the University of Belgrade – the Faculty of Architecture from 2017 to 2022. In total, 65 student works are analysed, authored by 154 students, as most of studio works at final faculty years (4th and 5th year of studies) are traditionally done in small student groups (2-4 students). The implementation of statistical analysis is useful in a such case with big sample. Moreover, this approach is praised in contemporary urbanism, to achieve the better understanding of urban planning and management [8].

All student works are statistically analysed by

several criteria developed through the research of the topic of urban programming as all analysed urban studios did not have a fixed urban- architectural programme to designed. Hence, all students were free to define urban programmes for their projects, as well as their micro-locations. The only preconditions were that the projects had to be
(1) connected with the afore mentioned 'broad meaning' of tourist-led urban development and (2) located in the wider area of Golubac Town.
The analysed 'research + design' urban studios have two major parts – analytical and design phrases – which are further elaborated through several steps, conducted during one faculty semester (i.e., five working months):

- The analysis of the current state of the researched area, in this case, Golubac with surroundings, through policy and data analysis, fieldwork and discussion with local representatives and experts;
- The evaluation of the current state in the form of a customised SWOT analysis – a table plus a mapping;
- Conceptualisation – to set up the "framework" for the future work on a chosen smaller location with a development vision, logo, buzzwords, acquired values, goals and conceptual spatial schemes;
- Programming – to form the functional programme by determining the scope of urban functions, indoor and outdoor activities and facilities with necessary spatial capacities, further supported with programme schemes. This phase, as well as previous one, is more within urban planning;
- Design – this phase belongs to urban design, with several inner steps from general to in- detail design of both indoor and outdoor places in the chosen location;
- Re-evaluation is technically the last phase, which is implemented always as the presentation of the draft design in a focus area in the middle of design process, with additional discussion with local

representatives and experts. Its aim is to get local reactions and feedbacks on presented concept, programme and preliminary design. They are used as final guidelines to complete design projects.

## 3 GOLUBAC AS A FOCUS AREA FOR STUDENT WORK

The research and design area for student works belongs to Golubac Municipality. Golubac Town (1,500 inhabitants) itself is strategically positioned at the western entrance of the Iron Gates Gorge (Fig. 2). Nearby Golubac Fortress marks this extraordinary position with a dramatic scenery. The fortress has recently reconstructed arisen a new local destination for cultural tourists (Fig. 3).

Fig. 2 The 120-km long Iron Gates on the Danube River are the longest gorge in Europe (Author: B. Antonić)

Fig. 3 Golubac Fortress is the most prominent cultural heritage site in Golubac Municipality: the fortress during reconstruction in 2018 (Author: B. Antonić)

The size of the area for student works occupies approximately occupies approximately 15 sq.km and consists of 12-km long Danube riverside and near hinterland. It includes six distinctive environments, of which five are well defined: urban (centre), rural-suburban (west), agricultural (south), water (north), natural-forest (east)-. The sixth environment encompasses several zones with vacation cottages and heritage locations scattered along the riverside (Fig. 4). The focus area for student works is rich in natural and cultural heritage. The Iron Gates or Đerdap in Serbian (Fig. 2) are both the oldest and largest national park in Serbia, with many rare and endemic species of flora and fauna [9]. Morphologically, the gorge is not monolithic; it consists of four inner gorges

("narrows") and three valleys in between. Then, the gorge was flooded by an artificial lake formed by the Iron Gates Hydro plant in the early 1970s. This combination of unique nature and human transformations makes the whole Iron Gates as a magnificent cultural landscape. Thus, the national park was proclaimed as the first UNESCO geopark in Serbia in 2018 [10].

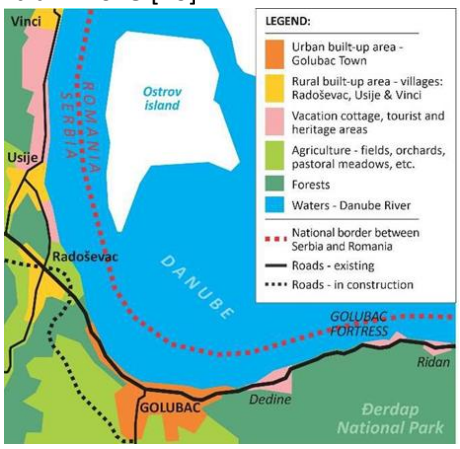



Fig. 4 Six six distinctive environments in the focus area of Golubac, Serbia (Author: B. Antonić)

There are several major locations of cultural heritage in the Serbian Iron Gates: "Lepenski Vir" site (prehistoric), Tabula Traiana (ancient Roman), the remnants of Traian Bridge (ancient Roman), Golubac Fortress (medieval), Fetislam Fortress (Ottoman), and Tumane Monastery (neo byzantine). Golubac Town is among minor attractions for cultural tourists. However, after the recent reconstruction of nearby Golubac Fortress in 2018 (Fig. 3), local tourist offer in the town has been significantly improved with new restaurants, bars, guesthouses, cafes, flats for rent, as well as with cultural festivals and other events. Furthermore, Golubac is the only place in the Serbian side of the gorge which has not been relocated with the formation of the afore mentioned the Iron Gates Lake [11]. Hence, it is the only settlement with preserved the 'old town' look – a preserved traditional matrix of Serbian market town with the main square (former farmers' market) and several protected monumental buildings. Golubac is a good showcase of 19$^{th}$-century Serbian market town with town rights (Fig. 5), which were officially received in 1881. Its urban fabric was initially organic, but it was regulated in late 19$^{th}$ century [12]. This urban feature has just started to be exploited for tourist purposes. On the other side, the old part of the Golubac is not big, as it covers several urban blocks around the square (Fig. 5).

Fig. 5 Golubac is a showcase of Serbian market town, especially its central part around the town main square (Author: B. Antonić)

## 4 URBAN PROGRAMMING AND CULTURAL TOURISM

Urban programming is one of the basic steps in the developing urban plan or urban design project. However, this seems to be (still) an 'unchartered territory' in contemporary urban studies despite programme and programming are well known and exploited terms in many scientific fields [13]. It can be described as a process to obtain adequate urban solutions for identified spatial challenges.

M. Palmer considers it as a preliminary phase to urban planning and design – the "gathering, organising, analysing, interpreting, and presenting of the information relevant to design [phase]" [14]. The ultimate aim of such phase is to enhance the efficiency, quality and understanding of the future urban development [15].

In this research, it is important to connect urban programming with the selection of a certain sites or locations – site analysis – for which student groups developed their urban projects. In the other words, the research is focused on how location characteristics influence the selection of the project function and size. There are several important criteria behind this selection. Urban Design Series Society defines it through five broad criteria: urban design in vicinity, transportation and accessibility, nature of site (topography, views, orientation, etc.), costs, and timing for project development [16]. Urban Design Lab determine four 'categories', further organised in several key topics: (1) culture and community, (2) landscape, (3) infrastructure and movement, and (4) built form [17]. The second division concurs with the three first criteria by the first division, as urban design in this sense includes

both the socio-cultural and physical elements.

In line with the previous, the analysis of student works in this research is based on the following criteria and indicators, plus correlation to prevalent urban functions:

I. URBAN FUNCTIONS:

1. Primary urban function: tourism, culture, education, transport and mobility, retail, housing, sport & recreation, health;
2. Secondary urban function (if any): the same as previous;
3. Ratio between indoor and outdoor facilities: the first of second dominant or balance between them;
4. History of function: fully, partially or non inherited site function;

II. CULTURE AND COMMUNITY:

5. Environment: in urban, suburban-rural, tourist (vacation and cultural sites), agricultural, water, and natural area;
6. Surrounding land: in, at the edge or outside built-up area;
7. Functional compatibility: fully, partially or non- compatible to nearby functions and land use;
8. Users for whom projects are planned: fully, mainly foreigners/tourists or fully, mainly locals.

III. LANDSCAPE:

9. Topography: flat, inclined terrain, water, combined;
10. Blue infrastructure: far from, close to, next to, on water;
11. Green infrastructure: far from, close to, next to, in green areas;
12. Viewpoint position: very, partially important or unimportant;

IV. INFRASTRUCTURE AND MOVEMENT:

13. Access to roads: crossroad site, next to, close or far away to major road (Fig. 4);
14. Infrastructural accessibility: high, medium or low.

V. BUILT FORM

15. Size of project by area: huge, big, medium and small;
16. Compactness of project: project = one site, project developed on several sites which are nearby/scattered across the research area;
17. Building density: high/urban, medium/ suburban or low density/rural and natural;
18. Physical compatibility: project fully, partially incorporated in or fully, partially contrasting to surrounding urban or natural fabric;
19. Respect to history: completely or mainly new construction, urban regeneration or urban and architectural reuse;
20. Building traditions/styles: completely, mainly international or completely, mainly regional or ethno-style.

## 5 ANALYSIS OF STUDENT WORKS IN GOLUBAC

As it was highlighted, 65 student projects with Golubac as a research and design focus had been developed in urban studio projects at the Faculty of Architecture in Belgrade. This pretty decent sample enables the study on how students comprehend the spatial imprint of cultural tourism through their projects by different aspects: functional, physical, locational, connective, etc.

### 5.1. Urban Functions

Big urban projects are almost always mixed-use today, which generates many advantages [18]. This is one of promoted premises in urban studios and had its phase – programming (Fig. 6). Therefore, both primary and secondary urban functions were examined. Two urban functions are both prevalent are primary and secondary in student projects: tourism and sport + recreation; as primary functions both are 25%, whereas tourism is more frequent secondary function – 38% vs. 29%. As many as 20 (32%) works have both named functions in combination. The third among primary functions is transport and mobility (18%), as it includes pedestrian and cyclist mobility as related zones. Among the secondary functions, culture is the third one, with 12% frequency. Interestingly, students connect the development of cultural tourism with sports tourism, which should be understood as Golubac is small and located next to the national park.

Studio projects in urban planning and design also promote the balance between indoor and outdoor spaces in big projects, which was the case in these studios, too. However, this is achieved in 29 or 45% student projects, while almost the same frequency was for the projects where indoor places are a focal element – 28/43%. Nevertheless, this is in line with

the previous finding of the significance of nature and sport and recreation as focal urban functions. A bit unexpected finding is that the majority of student works proposes functionally completely new facilities regarding their surroundings – more than 55%. This can imply that students try to be innovative and not to follow 'safe routes' in design.

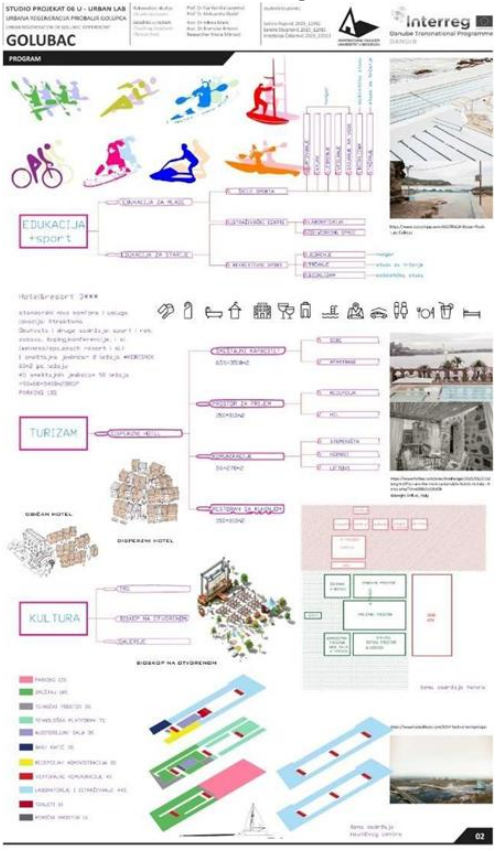



Fig. 6 Student poster with programming phase. Authors-students: I. Popović, S. Stojanović and A. Čakarević, 2023.

## 5.2. Culture and community

Golubac with surroundings offers several different environments, from urban to pure natural. Hence, the question of environment is one of the most distinctive in this research. Most of students properly identified that the town is still under- developed considering the booming number of tourists due to nearby cultural and natural attractions last years. 55% of their works are in urban area, while 15% are completely surrounded by nature and 12% are in already established tourist zones (vacation cottages, heritage sites, etc.). Rural and agrarian environments are less represented and the projects completely on water are the rarest ones (3 or 5%). However, the most of the projects located which are in three built-up zones (urban, suburban-rural, and tourist) are actually at their peripheries (60%), where possibilities for new development is with less limitations, so the potential for flagship projects is significantly higher (Fig. 7).


Fig. 7-8 Student posters with typical location of a student project – a new marina at the periphery of urban built-up area. Author-student: Z. Stanojević, 2020.

Almost all student projects present the facilities that are fully or partially compatible (95%) to their vicinity in a functional manner, regardless they are the continuation of existing facilities (i.e., total urban regeneration) or new ones.

The planned focal group in most projects is external users – tourists, visitors. The are planned to be dominant in 42% or prevalent users in 37% projects. This correlates to the afore explained prevalence of tourism, sport and recreation among primary and secondary functions. At the end, it is important to point that the projects that serve both external and local users are still in majority – 37/57% in all analysed projects.

## 5.3. Landscape

The incorporation of landscape elements in student projects is probably expected due to the abundance of natural attractions around Golubac of and the richness of local scenery in the gorge. This is very true for blue infrastructure or water, where the Danube has a key role; all projects which addresses the connection to water actually do this to the Danube, which is widest in its flow in the front of Golubac – 6-7 km. Although just 5% of student projects are fully or mostly on water, the Danube is

a constitutive element in more than ¾ of them, as the river next (32%) or close to the project (38%). Green infrastructure in Golubac area are urban parks and natural forest. The analysis shows that this is even more important element in student research and design, as only 9% of student projects are not close to green areas. Aside of this, the projects that were completely located in forests around Golubac are usually the largest ones, as they include the limited use of protected greenery for passive recreation and healing (Fig. 9).


Fig. 9 "Herbalibrium" Project – site plan for the sanatorium of traditional medicine above Golubac. Authors-students: J. Leković, A. Ljubičić, A. Popović and N. Rašović, 2020.

In contrast to green and blue infrastructure, student do not have a clear preference to a certain type of topography. Most projects (60%) are on flat locations, usually on the riverside. 29% are on steep and hilly locations, while only 6% combines both flat and inclined terrain. The aforementioned 5% projects are completely on water.

Even more undecided situation is with the inclusion of viewpoints in student projects. 25 (38%) of projects have viewpoints as important elements in their organisation and design; 22 or 34% have them, but they are of a secondary importance; finally, 18 or 28% of the projects do not show any affiliation towards view inclusion and viewpoint position. These findings are quite odd knowing that Golubac area is rich in hills, cliffs, and mountains and that inclined terrain probably makes 40% of near surroundings.

5.4. Infrastructure and Movement

Movement in this research is understood through road accessibility as this is a critical infrastructure for big projects in Golubac area. Pedestrian and cyclist accessibility practically concurs with proximity to the Danube in the previous section, as the analysed area only has several kilometres long combined pedestrian-cycling path along the Danube embankment.

More than the half of all student projects is located so to be perfectly accessible by road, being on the main crossroads (12%) or roads (42%). Conversely, 1/5 of the projects are remote and they are usually projects in forest that, on the other side, mainly endorse nature, eco-tourism and healing-by- seclusion. Interestingly, several projects attached to the main crossroads are usually flagship projects in infrastructure or very dependent on accessibility like marinas, intermodal nods, transport-oriented tourism or shopping centres (Fig. 10).

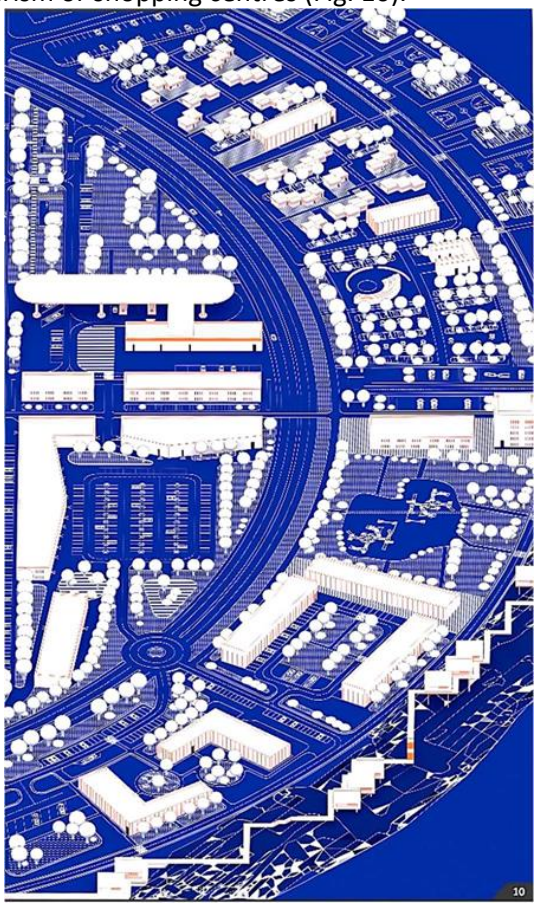


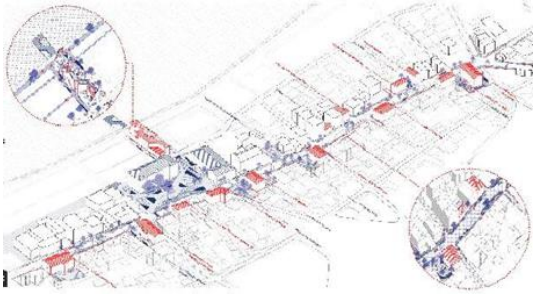
Fig. 10 The axonometry of a retail and tourist hub next to crossroad on Đerdap/Iron Gates Expressway (currently in construction) on the western edge of Golubac. Authors-students: I. Mangović, T. Nešković, S. Piščević and V.Tesla, 2023.

The other research question is the general quality of the other, i.e., communal infrastructure, such as water system, canalisation, electricity, etc. Three options are given: high (only the town, with all mentioned amenities), medium (other built-up areas, where canalisation is missing) and low (other locations without them). 29 (45%) student projects have high accessibility to communal infrastructure, 23 (35%) medium and 13 (20%) low. Practically, the projects which are limitedly accessible by roads are also critical regarding the other infrastructure.

5.5. Built Form

The largest group of the indicators is for the physical aspect of the student projects. The first one is their general size. In line with the urban character of studios, the most of projects are big (5-20 ha) or medium-sized (2-5 ha). The former ones make 28 or 43%, while the later ones 27 or 42% of all analysed student projects. Actually, the noticeable number of projects are close the threshold of 5 ha. On the other side, spatially huge (>20 ha) or small projects (<2 ha) are rather rare – both represent 8%. The largest project even has more than 50 ha (Fig. 9).

If compactness of a project is scrutinised, it is obvious that compact or one-location projects dominate (41 – 63%), followed by the projects that consist of several nearby sites (18 – 28%). The projects which cover several sites scattered through larger area are rarest (6 – 9%); however, all of them are thematically specific. The topic of three such projects is the renewal and modernisation of open public spaces in central Golubac, one of them is the network of eco-tourism sites above the fortress, while two of them are diffused hotels (Ital. *Albergo diffuso*) in the historic part of Golubac, with the implemented concept of an urban reuse at a small-town scale (Fig. 11).



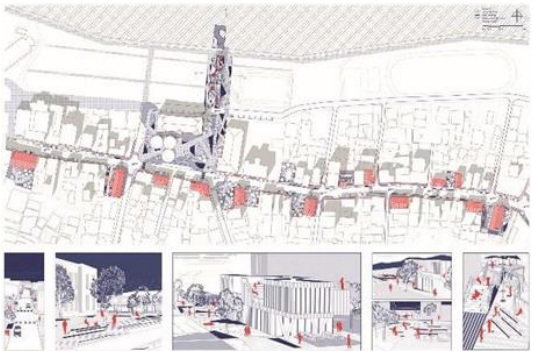


Fig. 11 The axonometry, urban composition, and 3D details of one *Albergo diffuso* project, based on an urban reuse at a small-town scale. Authors-students: T. Miletić, E. Stanisavljević and S. Stevanović, 2022.

The next indicator is a building density. Generally, it is in line with the location of a student project. Those rarest projects (13 – 20%) are those with a high density and they are mainly situated in central Golubac and based on urban renewal and building reuse. The projects with low building density are in the middle with the frequency of 37% (24 projects) and they are mostly within natural, rural and agricultural environment. The most frequent student projects (28 – 43%) are with medium densities. Their locations are also “in between” – et the edge of built-up zones (Fig. 7-8) or between them (Fig. 9).

The last three indicators are strongly connected with the design and appearance of the project, i.e., they represent the last phase of student work. The first indicator is the physical compatibility of student projects with their surroundings. The projects are diverse by it. Even mostly of them partially contrast to (34%) or are partially incorporated (28%) in their surroundings, the other two ‘stricter’ options are also well-represented; full incorporated projects make 18% of all projects, whereas those ones that full contrast to their surroundings are 20%. Any correlation with the other indicators is hard to be defined, which implies that this indicator is primarily linked with the creative side and the system of values of students. The next indicator based on built form concern if the student projects respect the historical elements of their locations and incorporate them into their design. Only four projects reuse old buildings giving them new urban functions (fig. 11), while an urban regeneration as an approach with more freedom is also more present – 12 projects (18%). These projects are mainly located in Golubac or next to the

fortress. The projects which are completely (Fig. 10) or mainly new constructions are more evident – 57% and 18%, respectively.

Building tradition or style is the last indicator and it refers to a difference between international and regional/ethno-approaches. Completely or mainly international or (neo)modern projects by their design make a great share – 52% and 31%, respectively. The projects that are based on regional or ethno-principles are rarer and they make 17% (11 projects). Again, rare projects are unique by the other indicators, so they are mainly student projects located in rural or natural environment and with primary function related to their environment – ethno- and rural tourism (Fig. 12), slow-city way of life, local culture and tradition, or organic production.

Fig. 12 Ethno-tourist complex with a rural museum in Usije Village: urban composition. Author-student: M. Galetin,

## 6 DISCUSSION AND CONCLUSIONS

The analysis of 65 urban-studio projects which students from the Faculty of Architecture student in Belgrade developed for Golubac area as a rising tourist destination in Serbia has some expected, but all some unexpected findings.

As it is expected students understood the broad meaning of (cultural) tourism in Golubac, so they projects were usually mixed use with a focus on tourism, hospitality, sport, recreation or culture. Similarly, they also noticed a necessity to sprawl such activities and locations along the long Danube Riverside in Golubac from the already booming town centre and the fortress. They also well-customised the main function(s) of their projects to nearby environment, so very small number of student projects was not functionally and physically compatible to their surroundings. Interestingly, albeit expectedly, student showed independence and innovation in the overall design of their projects and they did not follow “safe routes” in their creative process.

On the other side, the importance of the tourism based on sport and (passive) recreation in many student works was a bit of novelty. It seems that many of them saw Golubac as a part of the wider natural tourist region of the Iron Gates, regardless that the town is more focused on cultural heritage and tradition. Similarly, the relatively small number of the projects concern in-death urban regeneration and building reuse and such projects were almost exclusively focused on the town core. The other zones with such potential – nearby rural centres and the former industrial zone at the eastern edge of Golubac – were completely bypassed as potential location for redevelopment and new design. This is also in contrast to local expectation to expand tourist development from the town to nearby village and hinterland.

The present points underpin in which directions the future work with students in urban studios should be directed:

First, to preserve a spotlight on tourism, but expanding a joint discussion to other types of tourism which can be sustainable in Golubac and the Iron Gates;

Second, to broaden a discussion and lectures from urban development to urban-rural continuum and settlement vs. region relations in spatial development, which more matters in the case of Golubac, but also for many small tourist towns in Serbia and the Danube Region;

Third, to further insist on the significance of all types of urban renewal, including urban regeneration, revitalisation and reuse, and their adaptation to a small-town format. Many students were still not familiar how to implement them *in situ*, despite well-known theoretical models and approaches, but which are also mainly related to ‘stararchitect’ projects in global cities;

Last by not the least, teaching and learning process can be a ‘completed task’. In the case of urban studios in Golubac, they had to be expanded with the new ways and models of tourism development, as it was highlighted in the first part of this paper. This is especially significant due to big-format infrastructure projects which are recently finished or in progress in Golubac area, including new expressway to Belgrade which will make the

southern bypass of Golubac, expanded marina with subordinated yachting facilities, rising pilgrimage facilities in nearby Tumane Monastery and ferry border crossing in Usije Village.

## 7 ACKNOWLEDGMENTS

This paper uses the results of three completed European international projects: (1) Erasmus+ KA203 "Creative Danube: Innovative Teaching for Inclusive Development in Small and Medium-sized Danubian Cities" (2019-22); (2) INTERREG Danube "DANUrB – a regional network building through tourism and education to strengthen the 'Danube' cultural identity and solidarity" (2017-19); and (3) INTERREG Danube "Danube Urban Brand + Building Regional and Local Resilience through the Valorisation of Danube's Cultural Heritage – DANUrB+" (2020-22). The authors of this paper also want to thank all students at the Faculty of Architecture in Belgrade who participated in project-connected urban studios.

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# Connecting Past and Present: The Reshaping of Belgrade's Savski Square and the Challenges of Heritage Preservation

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## ABSTRACT

Positioned as an intersection between Eastern and Western cultures, Belgrade exhibits a multifaceted character and an uncommon amalgamation of diverse influences that manifest in its physical layout. The development of a railway network to connect Belgrade with other cities in Europe emerged as a pivotal aspect of modernizing the newly established capital of Serbia following its liberation. The spatial focus of this progress cantered around the Sava slope, and particularly Savski Square, where the first central city railway station, subsequently making it one of the most developed areas in Belgrade. The transformation of Sava Square aligned with the modernist trends of the interwar period, resulting in the construction of the semi-circular square. Nearly a century later, this square and its accompanying heritage buildings, neglected for over the years, captured the attention of urban planners and investors. Consequently, the objective of this paper is to present the transformation of this significant public space, which transitioned from a modernist square to its present-day form. The research is focused on exploring the modernist foundations of Belgrade, as well as the current practices of safeguarding and preserving invaluable architectural and urban elements. This will be achieved through the integration of architectural heritage methodology, which entails observing the space over an extended period, and urban methodology employing pertinent planning and design documentation. By deconstructing the recent reshaping of the square and assessing to determine the current treatment of this space and the heritage buildings that define it, the rapid construction of a new part of the city in its immediate surroundings, with the intention of physically connecting the new part of the city to the old core will be considered. Given that this space has become highly appealing to investors while also being a crucial urban location that defines the spatial development of modern Belgrade, it is challenging to ensure that its renovation is fully conducted in accordance with established principles of heritage protection and the preservation of the true spirit of the place. Therefore, this study pays attention to the aspect of educating various stakeholders involved in urban renewal, which should encompass both the historical facts associated with specific locations and a consistent approach to preserving their visual characteristics. The rationale behind this is rooted in the fact that such locations often become a playground for the expression of various populist aspirations, specifically the creation of a new, acceptable identity for the place that aligns with the current political ambitions of ruling structures. However, in the long run, this can lead to the formation of an inaccurate historical narrative.

**Keywords:** Urban development, Heritage preservation, Urban transformation, Savski Square, Belgrade

## 1 INTRODUCTION

Concepts and programs of training experts for work in numerous areas of cultural and architectural heritage protection began to develop during the 1950s and 1960s, when, after extremely large destructions in the Second World War, it was necessary to approach the restoration, protection and revitalization of numerous significant historical buildings and units, on a scale that had not been recorded in history until then. This required the engagement of numerous experts of various profiles, especially architects-conservators, of whom there were not enough. Based on the basic documents, the Venice Charter (UNESCO, 1964) and the Recommendation on the protection, on the national level, of cultural and natural heritage (UNESCO, Paris 1972), different education systems were started, especially for architects-conservators. It is recommended that universities and schools of all levels organize regular classes, lectures, and seminars on the history of art, architecture, urban planning and the environment. The aim was to encourage the spirit of the population and develop their respect for heritage. Education, in the field of education of architects and conservation technicians, has been significantly improved and based on common foundations, terminology and structure, depending on the level of education and specialty (architects, urban planners, archaeologists, builders, technicians, artisans, etc.). Teaching for future architects-conservators, as well as for art historians and archaeologists, was based on the theory and history of conservation, the history of architecture and urbanism, historical constructions and materials, methods of analysis, methods of protection, etc. On an international scale, the formation of ICROM, the International Study Centre for the Conservation [1] [2] [3] [4]and Restoration of Cultural Property in Rome, was particularly significant, which began its work in 1959 and to this day represents the most significant educational institution in the field of protection, on a theoretical and practical level [1].

If we look at the programs and education systems of conservators today, we come to the conclusion that the main attention is still focused on technical measures of protection, conservation and restoration of buildings and spatial entities, focused on their architectural, urban and natural qualities, and not enough on cultural identity, specific character and intangible heritage values [2]. In this sense, the biggest challenge of today's conservator education programs is connecting the concepts of cultural relations between tangible and intangible heritage, as well as identifying areas of own multinational, multidisciplinary and multi-layered connections. The protection of cultural heritage should respect the diversity of the cultural identity of different countries, and this should also be reflected in education programs. Another challenge is the integration of different disciplines and professions into conservator education programs. Conservation in practice requires the cooperation of different professions, at different levels, through architects, archaeologists, engineers, art historians, historians, and artisans. It can be said that today they do not cooperate enough through practice. The problem arises, how to integrate different professions in conservation procedures, each of which is highly specialized, and above all to include them in conservation education programs. It is believed that any approach to reconstruction should include the ability to observe, analyse and synthesize [3].

In order to overcome the aforementioned problems in practice, the Guidelines on Education and Training in the Conservation of Monuments, Ensembles and Sites were adopted, which ICOMOS adopted at a session in Colombo, Sri Lanka, in 1993, and which determines a number of issues that should be included in conservation education processes, as well as concepts for defining appropriate education programs. The document emphasizes that it is necessary to approach the issue of cultural heritage holistically, that is, systematically, on the basis of cultural pluralism and diversity, which should be ensured by professionals, experts, and administrators. Conservators should have a more flexible, but

also pragmatic approach, based on cultural awareness that should permeate all practical activities, education and training systems, decision-making processes, with an understanding of society's needs [4].

2 CASE STUDY SAVSKI SQUARE IN BELGRADE

3 Savski Square is placed at the edge of Belgrade's historical core, within the wider zone of Sava coast. Its position could be seen as well as an element of system of squares that belong to the Belgrade's central area i.e., direct connection with Slavija square along Nemanjina street (Figure 1). Importance of the Sava Square was given by Belgrade Waterfront project development because it is seen as the point of access to the new part of the city.

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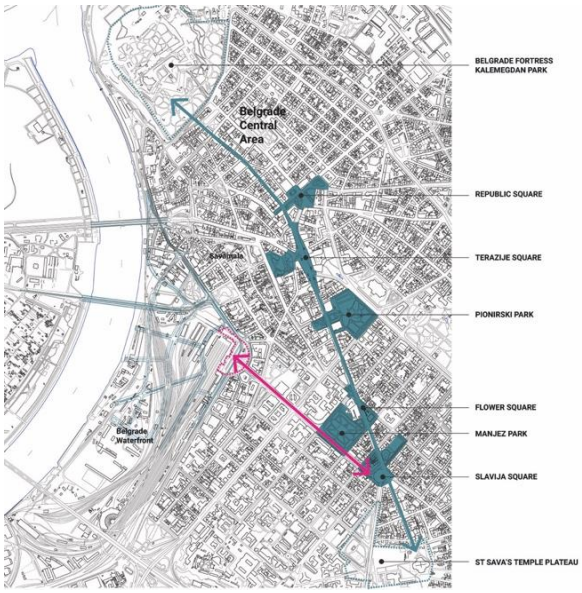


Figure 1: System of squares in the Belgrade Central Area

This location gained special interest after the construction of the Main railway station in 1884 [5]. Its arrangement was generated by the influence of French engineers Alban Chambon, Charles Leroux and Eduard Leger who oversaw regulation, levelling, framing of streets and squares [6]. Leger has defined the present form of the square in 1911 (Figure 2). Until 2012 it was predominantly traffic square that changed only in the field of regulation of traffic and areas for pedestrians, as well as vegetation and greenery.

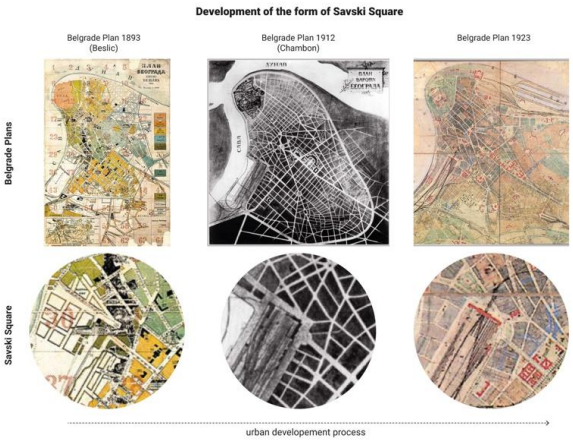


Figure 2: Development the form of Savski Square

In 2012 realised urbanistic-architectural competition for the arranging part of the square surface with the proposal for the Monument to the victims of the wars from 1990 to 1999. The square had such an organization for less than two years, more precisely until the adoption of the project Belgrade Waterfront in 2014 when new reflections on the reconstruction of the square began (Figure 3).

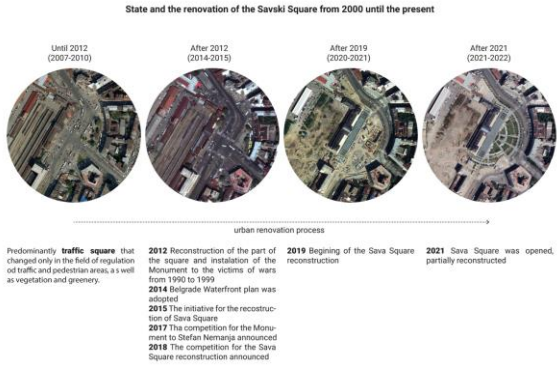


Figure 3: : Urban renovation process

It was followed by two international competitions - the competition for the Monument to Stefan Nemanja (2017) and the competition for the reconstruction of the Savski square (2018). In 2021 Sava Square got its present look and arrangement, which is in line with current trends in urban design, striving to reduce the intensity of car traffic and increase the area for pedestrians and greenery (Figure 4).

Figure 4: Winning competition proposal

Figure 5: The state of the Square after reconstruction

### 4.1 Buildings of the square and built heritage.

The buildings that define the Savski Square consist of structures that have different treatment in relation to protection and architectural heritage.

The **Main train station** (1) building is considered as cultural monument of great value in 1983. It was built based on the concept of Austrian architect Von Vlatich and design of Prof. Dragutin Milutinovic. The building was designed in academic style as a representative edifice with a dynamic floor plan. The central classicistic projection of the main entrance with the triangular tympanum dominates over the architectural composition. As a station of the frontal type, it was of a distinctly urban character, like those in the largest European cities [7], and its design greatly enriched the architecture of Belgrade. The Main train station was completely renovated by the Belgrade's Institute for Heritage protection in 2020, while in November 2020 it was announced that the Museum of History of Serbia will be settled there. Although it was reconstructed at the same time as Sava Square, the contact zone between the square and the building was completely interrupted due to inadequate levelling of surfaces, which lacked direct access from the square to the building. This can also be interpreted as a negative attitude towards the architectural heritage, i.e., the significance of this building.

**The Post building** (1928) defines the side of the square towards Savska Street. It was destroyed during the bombing in 1944, and completely reconstructed in 1947, gaining a completely new look - the present one, in a simplified socialist realism style, which is significantly different from the initial building built in serbo-visantian style. It is planned to relocate the current content of the post to place the content of the culture there. The post office building was designed according to the project of the renowned architect from this region, Momir Korunović. In June 2022, the city authorities announced that after the renovation of the old post office, it would house a theater and a library. In December 2022, it was emphasized that after the renovation, it would accommodate a school, kindergarten, children's theater, and a children's museum. The proposed uses are not in line with the fundamental principles of revitalizing historical buildings, which are based on the principle that after the renovation of historical structures, the new purpose must be in accordance with the original one. According to the announcements of the city authorities, the reconstruction of the building will be done in according to the original designs, which is opposed by experts in the field of protection of architectural heritage.

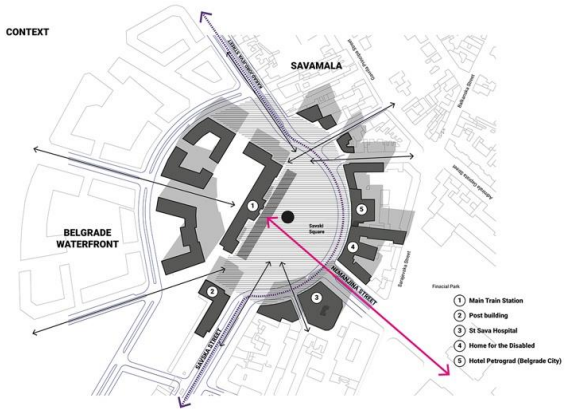


Figure 6: Context

**St Sava Hospital** was built according to the competition design proposal of architect Lavoslav Horvat, form 1929. Initially it was Building of the Central Office for Workers' Insurance Zagreb. In 1948 it got the hospital purpose, and now it is Special Hospital for the Treatment of Cerebrovascular Diseases "St. Sava". There is speculation in the media that the facility will be sold, and the hospital contents moved to another location.

**The Home for the Disabled** was built in 1932. Today, the Association of War Volunteers 1912-1918 of their descendants and admirers and the Association of Veterans of the People's Liberation War of Yugoslavia are situated there.

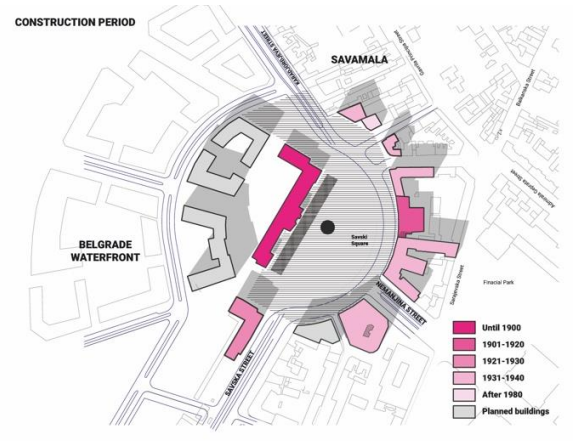


Figure 7: The construction period of the buildings that define Savski Square

Belgrade City Hotel, former **Hotel Petrograd** was built in 1912 following the neo-baroque and neo-renaissance spirit. The budling will be reconstructed following the former appearance and upgraded with superstructure which will not detract from the appearance of the existing building.

## 4.2 Development in History

The square originally emerged during the period between 1830 and 1869 under the leadership of Prince Milos Obrenović and his successor, Prince Miahilo Obrenović. Their objective was to develop the independent Serbian sector of Belgrade, imbuing it with a robust mercantile character [8]. At that time, Savski Square was predominantly marshland, but it held particular significance due to its proximity to the border with Austria. The establishment of the railway station in 1884 further elevated the square's importance, making it the central hub of Belgrade until World War I. The construction of the railway station was one of the conditions for Serbian independence in 1878, imposed by European powers. Austria emphasized the need for modernization and the end of isolation and self-imposed seclusion [9]. Savski Square, along with the entire Sava slope, evolved into the primary commercial district of Belgrade, featuring grand palaces owned by the wealthiest merchant families and incorporating innovative engineering and urban trends that endure to this day.

In the subsequent period of the Kingdom of Serbs, Croats, and Slovenians, and later Yugoslavia, during the interwar era, this part of Belgrade experienced its first phase of degradation and neglect. Several factors contributed to this transformation. The relocation of the border following the war, several hundred kilometers away, led to a decline in commercial significance. Many prominent merchants and investors had passed away in the intervening years. Moreover, as Belgrade underwent rapid expansion, the first Master Plan of Belgrade from 1923 was repeatedly revised until 1941. King Aleksandar Karađorđević, who was not originally from Belgrade, sought to imprint his personal influence on the capital [10]. Consequently, the new bridge inaugurated in 1935 transformed the Sava slope and Savski Square into an isolated and less accessible district [11].

Following World War II, Savski Square continued its descent into becoming one of the least favored and most deteriorated areas of Belgrade. Despite all the Master Plans of Belgrade from 1923 to 1985 calling for the removal of the outdated railway station that no longer served the capital's needs, the station was only decommissioned in 2018, with the tracks subsequently removed [12]. Furthermore, the construction of the so-called Mostarska petlja in 1974, with the main highway located just a kilometer away and within plain sight, further degraded the district.

The pinnacle of this decline coincided with the

violent dissolution of Yugoslavia [8]. International isolation, economic crises, social unrest, and political fragmentation led to the isolation of the square. The railway station was only frequented by those who could not afford bus transportation. The presence of an erotic cinema, Partizan (located in the former Home of Disabled palace), along with erotic shops, prostitution, visible poverty, and backwardness were vividly depicted in Želimir Žilnik's film "Marble Ass" [12]. Until recently, the square was considered one of the least desirable districts in Belgrade. In 2015, amid the European migration crisis, the square and its surrounding area attracted refugees from the Middle East and Afghanistan, leading to comparisons between Belgrade and Kandahar [8].

After 2012, when a regime from the late 20th century regained full power, a new political elite began to view the Sava slope as a lucrative venture, resulting in a transformation of the urban landscape [12]. The most conspicuous ideological landmark of this new ruling class was the oversized monument of Stefan Nemanja, which disrupted the character of the modern square. The New Historical Museum had originally been planned for the old railway station in 1993 [5, 7]

### 4.3 Ideology: Names and Monuments of the Square

The evolution of Savski Square's nomenclature itself reveals its ideological usage over time. In 1920, after World War I, the square was named after American President Woodrow Wilson, who was immensely popular in postwar Europe. However, during the Nazi occupation in 1941, the name Wilson was deemed inappropriate, leading to the square's renaming as Serbian Square.


Figure 8: Chronology of the given names

In the era of communist Yugoslavia, the square underwent another name change, becoming "The Square of Fraternity and Unity" in accordance with the prevailing ideology (see Figure 8). Ultimately, in 1992, the square was renamed simply as Savski Square. After 2012, a new government, fully embracing the nationalist course of the 1990s, erected a monument to the "Victims of War and Defenders of the Fatherland" from 1990 to 1999. This monument lacked artistic value and was placed in an inconspicuous location. In a similar context, the "Eternal Flame" monument was erected in the Park of Friendship in the summer of 2000, following the 1999 NATO intervention, just below the former Central Committee building of the Communist Party of Yugoslavia [13]. However, in 2020, during the extensive reconstruction of the square, the monument was quietly removed.

Over a span of a century, marked by periodic crises, recessions, poverty, and war devastation from 1920 to 2020, Savski Square developed within the framework of neoclassical architectural and urban principles. However, this logic was disrupted at the end of 2020 with the installation of the Stefan Nemanja monument. While this monument served as an expression of historicist appeal to the roots of modern populism, aiming to evoke admiration and pride among the masses, it also generated public reactions of rejection, resentment, and even ridicule. The disruption of the harmonious and sophisticated urban unity was both glaring and brutal. The sculptor, Alexander Rukavisnikov, hailing from Moscow, held a prominent position as an official artist in the late Soviet era and remained influential in Russia. The selection of Rukavisnikov underscored the close ties between the Serbian political elite and Moscow. The grand inauguration of the Square with the Stefan Nemanja monument took place on Saint Sava's Day, January 27, 2021, marking and celebrating the date associated with Stefan Nemanja's son.

## 5 CONCLUSIONS

In parallel with activities on the protection, revitalization, and presentation of Sava Square in Belgrade, it is necessary to start a series of promotional and educational projects, as well as public discussions, which would aim to raise public awareness of the importance of

preserving cultural heritage. Also, the projects should deal with the development of strategies for efficient collection of documentation, construction, and information for identification of the work and the formation of the appropriate register on cultural heritage, because not all presented objects are adequately valued and protected. In addition, through projects, it is necessary to develop incentives and support for journalistic activity, organization of exhibitions, workshops, professional and scientific gatherings, etc. For these projects to be successful, they need to be based on the participation of all relevant actors, architects, urban planners and planners, historians of architecture and art, participants in education and protection, as well as responsible persons in all administrative and institutional structures, with mandatory inclusion local population.

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# Transdisciplinary educational method for architecture employing cinematography and poster-specific illustration

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## ABSTRACT

To illustrate the expressive potential of architectural space, the dynamic process of spatial perception, and the concept of the city as a representation of a historical period, cinematography is commonly used as a reference in architecture education. This paper will address the potential of cinematography as an educational tool for the study of architecture and the way it was implemented during the first two editions of the SF(a): Society, Film, and Architecture workshop. Highlighting the connections between architecture and the social, cultural, and economic context of a period was the educational aim of this extracurricular activity initiated by the "G.M. Cantacuzino" Faculty of Architecture of Iaşi. By comprehending the context-specific variables, the student gains a broader grasp of the of architectural phenomena and is encouraged not to restrict his investigation solely to the spatial, morphological, and stylistic features of an individual architectural style. Lecturers from a variety of disciplines, notably architecture, visual culture, photography and motion picture, graphic and industrial design, literature, philosophy, and history, were invited to contribute to this transdisciplinary educational methodology.

Hands-on activities that additionally serve as research tools for design are widely reinforced in architecture education. In this regard, a requirement of this extracurricular activity was the design of alternative posters developed as a critical interpretation of the meaning of the architecture represented in the cult movies Metropolis (1929), directed by Fritz Lang, and Blade Runner (1982), directed by Ridley Scott. The SF(a) workshop is an educational approach that improves students' capacity to critically evaluate, represent, and decode visual content. At the same time, the interconnections between what may at first glance appear to be distinct areas of knowledge are emphasized, helping students to comprehend the role architecture serves in the contemporary socio-cultural system. The primary objective of such activities is to cultivate and enhance the development of creativity, critical thinking, synthesis abilities, and teamwork abilities. The secondary objective of the workshop is to develop a sense of inclusion among students within a comprehensive and integrated learning environment that incorporates clearly stated objectives. SF(a): Society, Film, Architecture is an educational initiative that places its emphasis on non-formal educational pursuits. It achieves this by utilizing science-fiction films that depict hypothetical dystopian societies, with the aim of providing valuable perspectives on alternative social structures referred to as micro-utopias. The purpose of these micro-utopias is to provoke critical reflection on prevailing ideologies and stimulate individuals to envision and construct an improved future.

**Keywords:** architectural education, transdisciplinary workshop, extracurricular activity, cinematography, poster illustration

## 1 INTRODUCTION

Whether one is willing to acknowledge it or not, the Romanian education system has a number of deficiencies. The implementation of many changes aimed at shifting the didactic activities towards a student-centered approach has not resulted in a significant change in the prevailing structural mindset. In this context, we draw attention to the professional contributions of Everett Reimer. According to the publication "School is dead: An essay on Alternatives in Education" [1], educational institutions have effectively institutionalized the process of education due to their alignment with consumer-driven societies. These societies operate under the assumption that individuals primarily desire consumption and, in order to sustain continuous intake, they must become bound to the perpetual cycle of manufacturing. This image, reminiscent of the movie Modern Times (1936), directed by Charlie Chaplin, holds contemporary relevance in its portrayal of educational institutions as factories delivering individuals who will eventually join the expanding global labor market.

Based on previous teaching experience, we can state that several factors contribute to students maladjustment in relation to highly specialized topics, as well as struggling with consolidating the newly acquired information. These traits relate to a significant level of resistance exhibited by students when encountering topics that are fundamentally unfamiliar to them, both in terms of content and the manner in which they are approached, such as direct and individual engagement with the tutor as well as the study and execution of architectural projects. Many students have a sense of unease when it comes to addressing assignments, papers, or projects, perceiving these tasks as unfamiliar and overly difficult. In response, students exhibit signs of absenteeism, displaying decreased interest in their assigned tasks. However, the most concerning behavior is the occurrence of creative blockage and disengagement from the learning processes. One phenomenon that arises from the shift from high school education to advanced university education is the occurrence of maladjustment. This disruption is characterized by a lack of communication and collaboration among students, as well as a lack of correlation between theoretical knowledge and real-world application. The vocational profile requires proficient cooperation abilities, and this feature is fostered from the first year within the specialized disciplines through various activities such as projects, seminars, and papers, which emphasize the need for teamwork. The outcomes of these projects are deemed poor, suggesting a lack of effective collaboration among students while engaging in small group projects. This occurrence can be attributed to their limited understanding of each other and to their highly diverse backgrounds.

This paper elucidates the main factors that drive the SF(a): Society, Film, and Architecture workshop extracurricular activities. The first author of this paper's PhD research served as the initial source of inspiration. Her study is centered on developing a typology of cities portrayed in science fiction films, encompassing both actual and fictitious urban settings. The focus is on films that present dystopian societies of the last century, starting from the main architectural and urban trends that have been studied since the beginning of the 20th century until the present day. The objective of this PhD research is to identify additional instructional methods, including non-formal approaches, that facilitate the development of new skills, namely critical thinking, and synthesis abilities. Another source that we reference consists of two opinion articles authored by Ciprian Mihali and published in the year 2019.

The primary focus of the article titled "Trădarea universitarilor" [2], centers on the author's assertion that universities no longer serve as hubs for critical thinking. Additionally, the author argues that universities now primarily equip young individuals to assume the role of servants rather than active citizens. We want to explore the term "citizen" in a historical context, focusing on its initial significance rather than its contemporary definition as an individual who holds rights and responsibilities within a state. The individual in question can be defined as a resident of an urban area, as opposed to a rural or suburban one, where their activities have a

significant impact on the community as a whole. It is not the citadel, in this case the city, as the localizable and delimited space, that makes us citizens. Instead, it is our mindset and perspective in realizing that we are essential parts of a larger whole, regardless of its diversity or homogeneity. In a second opinion article titled “Studenții din România au îmbătrânit înainte de vreme” [3], Ciprian Mihali brings to our attention the phenomenon of the collective character, specifically the students, gradually fading from the public stage. The author further provides an explanation for this phenomenon of diminishing visibility within Romanian society: the decline of the critical mindset and societal resistance can be largely attributed to the apathy and conformity that today's students employ in their pursuit of constructing a peaceful future. The conclusion drawn from the analysis is that students have experienced premature aging, along with their parents and educators. While refraining from challenging C. Mihali's viewpoint, we might find common ground in acknowledging the need to adopt critical thinking. Nevertheless, we can confidently state that students in the vocational education field do not display apathy towards the cultural and social context, and they show the opposite of conformist behavior. A key component that is notably missing is the opportunity for engaging in discourse, or more precisely, being invited to take part in such debate.

## 2 OBJECTIVES AND ACTIVITIES OF THE SF(a): SOCIETY, FILM, ARCHITECTURE WORKSHOP

The reason behind the exercises carried out during the SF(a) workshop described in this paper was to request that students provide a critique of contemporary society and articulate an ideal vision that they aspired to achieve. The prevailing viewpoint was that the current education system is unsuitable for the present social and economic circumstances and that there is a need for reform in order to enhance competitiveness within the progressively dynamic labor market.

To address such circumstances, the suggested approach is the implementation of a non-formal and extracurricular educational initiative. This project consists of a workshop that encompasses both didactic elements, such as a series of lectures, as well as practical activities, like the design of an alternative movie poster. The activities aim to foster the growth of creativity, critical thinking, synthesis abilities, and cooperation skills. The secondary scope of the workshop is to promote a sense of belonging among students within a cohesive and interconnected educational framework that encompasses well-defined goals.

On a voluntary basis, students enrolled in architecture education as well as other fields constitute the target group. At the first edition, there was a total enrollment of 25 students, but in the subsequent iteration, the number of participating students increased to 65. The lectures were accessible to both the public and those with knowledge in the field. To facilitate these events, we collaborated with the A.S.A.I. student association and the Romanian Order of Architects, namely the North-East branch. The workshop was held over a period of six days, taking place between the end of June and the start of July, namely between the time frames of 16:00 and 20:00. The project has several broad goals, including the development of teamwork skills in collaborative environments as well as the use of creativity and personal viewpoints in order to enhance project outcomes.

The stated objectives encompass several key areas: fostering applied creativity among students, applying theoretical knowledge to real-world settings, critically analyzing a particular artistic work, namely a cinematographic achievement, acquiring practical skills through the design of a poster or alternative advertisement, developing graphic communication abilities through hands-on experience with contemporary graphic representation techniques such as Adobe Photoshop, Corel Draw, and Adobe Sketch, promoting competitiveness and adaptability, nurturing critical thinking skills, cultivating analytical abilities, and cultivating the development of synthesis skills.

Throughout the course of the project, a variety of didactic techniques were employed, tailored to the specific stages and activities outlined. The

project entails the dissemination of its objectives and working methods during its launch, as well as the subsequent showcasing of the completed works. This involves the communication of knowledge in a variety of academic fields, including the artistic areas of photo-video art, cinematographic art, and contemporary philosophy, as well as urban sociology, history, and the theory of architecture. Group talks at the preliminary level involved students engaging in collaborative conversations under the guidance of an expert educator. Collaborative exercises were recommended throughout the implementation phase of the workshop, namely for the creation of a poster and a film review.

The workshop activities featured participation from the teaching staff of the "G.M. Cantacuzino" Faculty of Architecture of Iași and the Faculty of Letters of the "A.I. Cuza" University of Iași. Other institutions that took part in the event included the Faculty of Visual Arts from the "George Enescu" University of Iaşi, the Research Laboratory for Art and Technology at Aalborg University in Denmark, and the University for Continuing Education Krems in Austria. Additionally, professionals from the fields of architecture, graphic design, and advertising participated as guest speakers (Table 1).

Table 1 SF(a) Society, Film, Architecture (2023): Lecture titles and speakers' affiliation

| Lecture title | Affiliation |
|---|---|
| *Metropolis* and the Dystopian Imaginary. (Re)Interpretations | Faculty of Letters "Alexandru Ioan Cuza" University of Iași |
| Echoes of visual expressionism from Metropolis in contemporary popular culture | Faculty of Visual Arts and Design, "George Enescu" Arts University of Iași |
| Metropolis from the perspective of contemporaries | Center for Image Science, Danube University Krems, Austria |
| Text, image and point cloud datasets as design materials for machine(s) learning based architectural design | Research Laboratory for Art and Technology at Aalborg University, Denmark |
| ARCHETYPE | Private practice - illustration |
| Guess Who's Back | Private practice - design |
| Narrative confluences & VR Modernism | "G.M. Cantacuzino" Faculty of Architecture, „Gh. Asachi" Technical University of Iași |
| The Modernist Utopia | |
| History and evolution of poster specific illustration | |

The project was organized into six different phases, each encompassing a set of well-defined tasks. During the initial phase, subsequent to the project's initiation and the exposition of its aims and operational approach, the fundamental principles that serve as the foundation for the project's activities were established. The first is society, which refers to the manner in which the socio-cultural values of present-day society are depicted within the visual cultural sphere, namely within the realm of artistic production. The second concept is film, a medium of visual storytelling that serves as a reflection of societal ideals within a certain period, and the third is architecture, which has a significant role in the realm of art, notably in the medium of cinematography, where it is often shown in imaginative and visionary forms.

The screening of Fritz Lang-directed movie Metropolis (1927) was the next to follow. During the next phase, spanning several days, the lectures delivered by the guests facilitated an examination not only of the film's storyline, which underscores the interplay between humans and technology, but also of the use of graphic imagery in its portrayal. The objective of these lectures, accompanied by open discussions, was to not only disseminate new knowledge from disciplines

associated with architecture but also to place the modernist movement within a socio-cultural framework encompassing architectural design, visual arts, literature, philosophy, and history.

The first edition of the SF(a) workshop focused on a critical analysis of Ridley Scott's movie Blade Runner (1982), drawing inspiration from the philosophical works of Frederic Jameson, particularly his exploration of postmodernism, or the "Cultural Logic of Late Capitalism". In a manner akin to the aforementioned methodology, the selection for the second edition entailed the inclusion of Walter Benjamin's seminal book, "The Work of Art in the Age of its Technological Reproducibility". During the third stage of the workshop, a series of practical exercises followed, namely guidance using Adobe Photoshop and Adobe Illustrator. During these instructional sessions, students were provided with comprehensive knowledge regarding these software applications as well as guidance on composing an alternative poster. During the fourth stage, the students engaged in open dialogues, centered around the designs they had created as part of their endeavor to produce alternative film posters. Significant importance was attributed to the synthesis capacity and the communicative impact that the proposed image will have on individuals unfamiliar with the film's storyline. There were further deliberations pertaining to the manner of composition and the recommended framework for structuring the movie review that the students were assigned.

The sixth stage consisted of two phases: the evaluation of the posters submitted by the students and the subsequent evaluations, followed by the unveiling of the exhibition and the awarding of the students who created the most outstanding posters and reviews (Fig. 1).

The inauguration of the exhibition and the presentation of awards by the jury occurred within the walls of the inner courtyard of the “G.M. Cantacuzino" Faculty of Architecture. Subsequently, a roundtable discussion ensued, whereby speakers, participating students, and other members of the teaching staff were extended invitations to engage in the event. The posters were further showcased in the Fab Lab offices located in Iaşi.


Fig. 1 Alternative poster designed by students for the movie Metropolis (1929), directed by Fritz Lang

The SF(a) workshop embraces the concept of "together" in all its facets, therefore acknowledging and valuing the importance of collective unity. In the realm of cinema, individuals from many disciplines, including students, instructors, architects, designers, artists, engineers, and photographers, engage in a collective exploration, analysis, and exchange of ideas. Within this shared space, they engage in activities such as viewing, discovering, discussing, arguing, learning, working, debating, and evaluating, as well as augmenting and enhancing their understanding of a subjective and intimate reality. The SF(a) logo encompasses several referents such as invitation to debate, dialogue box, motion picture, 3D glasses, architecture, and Science Fiction. These elements are presented in a manner that adheres to the proportions often found in movie posters. Therefore, it can be argued that the logo functions as a self- contained billboard and serves as an optimal catalyst for

initiating discourse. The utilization of monochrome and consistent line thickness in the logo establishes the foundation for fostering a well-balanced discourse within a neutral environment that refrains from exerting influence, coercion, or causing discomfort. The SF(a) posters are characterized by their animation, which stems from the perpetual absence of a definitive resolution. They resemble a signaling system that is not driven by the destination it intends to convey but rather by a starting point that leads to an unpredictable outcome. The individuals who participate in the activities and are involved in the creative processes associated with society, cinema, and architecture are the subjects of interest. The poster symbolizes a distinct moment in time, a moment that holds both anticipation, encounter, and recollection.

How can one effectively convey a message without unnecessary verbosity, without imposing specific instructions, and without beforehand influencing the outcome of the message? Several inquiries occur when faced with the task of creating a poster for a workshop centered around the production of alternative film posters. The posters include an inherent didactic function, as they convey a message and express a quest that combines personal observations and an adaptive process to one's own world. Consequently, they offer fresh perspectives for others to understand.

The poster is characterized by a whimsical arrangement of space in two dimensions. It explores the concept of freedom, particularly freedom of expression, and emphasizes the defiance required to engage with many components such as iconography, materiality, scale, hierarchy, temporality, expression, color, rhythm, tone, abstraction, and materialization. The process of creating a poster involves a systematic synthesis, wherein the objective is to effectively convey a message via the graphical representation of concepts and language. This requires achieving a harmonious balance between the conceptual framework, visual elements, and textual content.

The use of chromatic elements might be understood as a deliberate response to a metaphorical inquiry into the color palette of a monochromatic film. Therefore, the depicted items undergo a reduction in color saturation, serving as a visual focal point in Fritz Lang's film. In contrast, the background draws inspiration from the vibrant, colorful spectrum of the various activities, such as workshops, exhibitions, or round table discussions. The aforementioned source offers a wide range of customized items, including views, flyers, brochures, bookmarks, diplomas, and poster illustrations. This source is highly versatile and can be simply adapted for both digital and print mediums. The inclusion of a certain element inside each image is contingent upon the contextual factors at play.


Fig. 2 SF(a) Society, Film, Architecture exhibition poster, 2022

For the first edition poster, the visual depiction portrayed the fluctuation between the hues of red and green, symbolizing the contrast between artificial and natural realms. The color scheme of the traffic lights in Ridley Scott's film "Blade Runner" served as the inspiration for this dichotomy (Fig. 2). In the subsequent edition, the entrance to the residence of the inventor, Rotwang, may be observed in either a closed or open position (Fig. 3).

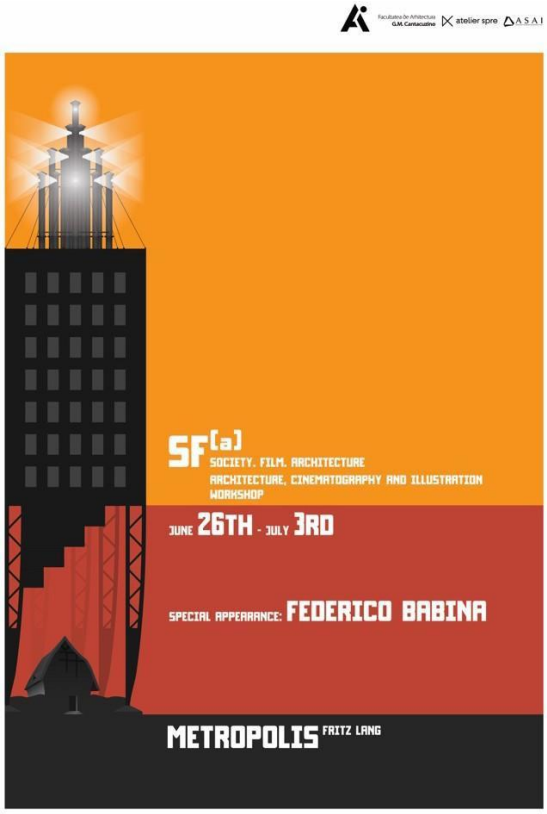


Fig. 3 SF(a) Society, Film, Architecture workshop poster, 2023

The presence of minor fluctuations inside the framework of the broader composition introduces additional dimensions of analysis to the representation, transforming it into a dynamic component. Both anticipation and nostalgia are present in the posters. The presence of both a place for waiting and a room for reflection creates a nuanced boundary that individuals who choose to participate must navigate. The aforementioned approach of moving ahead and backward transforms the posters into a symbolic boundary that delineates the transition from a previous state to a subsequent one, marking the distinction between a past era and the present day. The posters of SF(a) serve as a means to establish and preserve the audience's anticipations and recollections, transforming them into a memento encapsulating the experiences, emotions, and sensations associated with a voyage, from the first desire to engage with the event to the subsequent sense of having attended it.

The educational system has demonstrated an understanding of how to engage direct recipients, such as children, teens, and young people, by employing a strategy of oversaturation with a multitude of activities [1]. One potential consequence of inadequately structured extracurricular activities is the potential decline in students' critical thinking skills and capacity to synthesize information. The addition of this conclusion may appear odd in the context of an essay that focused on an extracurricular activity. However, the distinction lies in the pedagogical approach employed, specifically in the shift away from the traditional education banking system as described by Paulo Freire in "Pedagogy of the Oppressed" [4], where the professor assumes the role of the teacher and the student assumes the role of the passive trainee. The primary objective in interdisciplinary activities aimed at students should be the attainment of “conscientização” [4], which refers to the development of *critical consciousness*. The transmission of this condition of freedom of thought from the speaker to the audience does not occur over a two-hour speech, suggesting that the audience members themselves must possess the intent to attain this state. According to P. Freire, it is emphasized that the underlying flaws of our educational system can only be transformed through the implementation of praxis and dialogue.

What is the reason for the use of dystopia as a non-traditional education method? What could be the reason for not doing so? Architecture is not an isolated entity but rather a manifestation of societal influences. Similar to other visual arts encompassed under the realm of visual culture, architecture embodies the aspirations, values, and concerns of society. Nobody will ever design or build architecture simply for the purpose of communicating a message; similarly, nobody will ever propose the implementation of a dystopian society. However, it is essential to direct our attention towards the presence of dystopia in contemporary society, particularly within the current socio-cultural landscape. The concept of dystopia has evolved beyond its original purpose as a tool for deconstructing potential futures. [5]. The concept of dystopia has emerged as a distinct subject within contemporary socio-

cultural discourse. The examination of present-day dystopias fosters dialogue surrounding many societal facets that may deteriorate if proactive measures are not taken to address these currently prevalent issues. Simultaneously, it is necessary to conduct a thorough analysis of the current anxieties in order to ascertain the underlying causes of the prevailing sentiments of apathy and indifference. These sentiments may be observed within the educational framework, including not only students but also their teachers.

## 3 CONCLUSIONS

We would like to highlight the following aspects regarding the SF(a) workshop: The interest in this particular event experienced a notable increase, with the number of participants rising from 25 students during the first edition to 65 students in subsequent editions. Additionally, it is worth mentioning that three participants who are not affiliated with the "G.M. Cantacuzino" Faculty of Architecture also took part. To enhance the visibility and promotion of such projects, we have developed a dedicated website. The significance of networking across various architectural and related fields cannot be overstated, as it ensures the sustainability of the project. Furthermore, securing adequate funding sources is essential for the optimal development of these initiatives. This includes acquiring necessary equipment, granting prizes, and most notably, facilitating transportation and accommodation for external guests. The acquisition of critical thinking and synthesis abilities is deemed crucial in our approach, particularly when considering the analysis of project results, including student critiques and alternative posters. In summary, SF(a) is a project centered around non-formal educational activities, and it utilizes science-fiction movies that depict potential dystopian societies to provide us with a glimpse of a more suitable dimension of society, referred to as micro-utopias.

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# Project „Cultural Landscapes in Banat”. Project methodology and transfer of information to a younger generation of researchers

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**ABSTRACT**
The Cultural Landscapes in Banat project seeks to identify and catalog the cultural landscapes within the Romanian Banat region, associating them with a new tool called Heritage Value Areas (HVA). By implementing a series of proposed actions, the objective is to enhance the understanding, interpretation, and management of heritage and cultural landscapes. The traditional approach of preserving heritage primarily by classifying individual elements scattered across the region is insufficient. Such elements have a low likelihood of survival, use, and appreciation. Instead, all aspects of heritage value within well-defined areas can be interconnected by a shared context with known and accepted rules and values.
The research started in 2020 and is rooted in biographical and on-site studies conducted by a multidisciplinary team. Thus far, the project has generated an initial map outlining the division of Banat into landscape units and sub-units. Additionally, a methodological guide, outlining the project's approach to identifying cultural landscapes, has been completed and published online. Furthermore, an online platform containing information about these investigations has been launched.
Key findings from the study include: the inconsistent presentation and interpretation of the concept of cultural landscape in Romania, along with limited knowledge about it; the existence of unaltered areas in Banat when viewed from a landscape perspective; a growing interest in the concept of cultural landscapes; the presence of a substantial and high-quality documentation database, which partially underpins this project.

**Keywords:** cultural landscape, methodology, map, multidisciplinary, Banat, Romania.

## 1 INTRODUCTION

The notion of "cultural landscape" represents a relatively recent addition to the realm of cultural heritage management and spatial planning within Romania. On the international and European plan, this concept holds significant importance for the preservation of territorial identity, distinctive characteristics, and overall integrity. It stands as one of the paramount tools in safeguarding cultural heritage, operating not only at the level of individual ensembles or objects possessing heritage value but also at the broader contextual level.

A cultural landscape can be defined through various definitions but is broadly recognized as a discernible geographical area shaped by human activities. Such landscapes facilitate a profound comprehension of a specific place, region, or territory. They manifest as environments influenced or crafted by human intervention, and they may bear associations with significant historical figures or events. The scale of a cultural landscape can vary from expansive regions to the confines of a few households, encompassing diverse settings such as vast estates, industrial sites, parks, gardens, cemeteries, campuses etc. In essence, cultural landscapes collectively represent artistic endeavors, narratives of culture and manifestations of regional identity.

The inception of the term "cultural landscape" is attributed to the 1972 World Heritage Convention, which formally recognized it as an arena where human activities intermingle with the natural environment. Cultural landscapes are categorized as cultural properties and epitomize the dynamic interplay between humanity and nature. They serve as illustrative depictions of the evolution of societies and settlements over time, shaped by physical constraints and opportunities stemming from diverse natural, social, political, economic, and cultural contexts—both internal and external. [1]

According to the classification delineated by UNESCO, cultural landscapes are broadly classified into three categories: designed, evolving (which can encompass fossilized or continuously evolving landscapes), and associative.[2]

At the same time, the European Landscape Convention, the basic international document of this project, specifies the following: landscape is an important resource for fostering economic activity, whose protection, management and planning can lead to the creation of new jobs; landscape is a bond of local cultures, contributing to human well-being and strengthening European identity; landscape is an essential element of social and individual well-being.

In Romania, the incorporation of the World Cultural and Natural Heritage Convention occurred in 1990 through the enactment of Decree No. 187 on March 30th. Concurrently, the Law regarding the protection of historical monuments (Law no. 422/2001) contains a somewhat imprecise reference to this concept, at times equating it, albeit problematically, with the notion of a site. This equivalence raises questions, as a cultural landscape transcends the confines of a mere site. Also, in practice, the institutions involved in safeguarding heritage are used to understand concepts related to the built environment but lack a deeper understanding in relation to all the values encompassed by cultural landscapes. Furthermore, the concept of cultural landscape has found mention in prior heritage theses, wherein it is primarily approached in accordance with the framework articulated by UNESCO. However, these theses have also introduced the concept as a prospective urban planning instrument, denoted as the Local Landscape Plan (LPP).[3]

Within this contextual backdrop, our undertaking encompasses the Cultural Landscapes in Banat project, specifically centered on the formulation of a novel operational instrument termed Areas of Heritage Value (ZVP). Simultaneously, the project endeavors to pinpoint regions within Banat endowed with the potential for cultural landscapes.[4]

## 2 PROJECT PRESENTATION

The CULTURAL LANDSCAPES IN BANAT project introduces an innovative thematic and

interdisciplinary approach to landscape analysis, marking a notable departure from previous practices within Romania. This approach holds the potential for broader national applicability. The primary objective is the development of a novel operational instrument termed ZVP (Areas of Heritage Value) for the Banat region. This instrument undertakes a comprehensive analysis of and underscores the inherent values within the territorial context. Importantly, it exhibits greater flexibility than a General Urbanistic Plan and transcends the restrictive administrative boundaries of individual municipalities.[5]

Within the Romanian context, heritage protection traditionally diverges into two distinct categories: one centered on the preservation of the built environment and another dedicated to the preservation of the natural framework. However, there exists a significant gap in the form of a comprehensive working tool that bridges these two domains and facilitates effective communication between these integral components. Regrettably, conflicts frequently arise in situations where these two domains intersect, underscoring the pressing need for a unifying framework.

### 2.1 Project objectives

The project's objectives can be delineated as follows:

- To conduct a comprehensive inventory and precise identification of cultural landscapes situated within the Banat region.
- To formulate a robust methodology for the systematic identification and judicious selection of these cultural landscapes.
- To generate a preliminary cartographic representation of cultural landscapes in Banat, whereby each cultural landscape is equated with an Area of Heritage Value (ZVP).
- To elucidate the legal and regulatory status that these designated areas will assume, along with an assessment of their alignment with existing heritage protection systems.
- To provide essential assistance to public institutions and local administrations in comprehending and effectively utilizing this innovative instrument.[4]

### 2.2 Project phases

The project unfolds through three principal phases:

#### 2.2.1 Phase 1: identification

This initial phase focuses on the development of a comprehensive methodology for the identification of cultural landscapes. Up until this point, the study primarily concentrates on the tangible and observable aspects of cultural landscapes.

#### 2.2.2 Phase 2: identity

Phase 2 delves into an exploration of the territory from the perspective of intangible values, encompassing elements such as lifestyle, traditions, customs, and more. This phase incorporates the sociological, anthropological, and ethnographic facets of the study. These disciplines augment the findings from Phase 1, fostering a more holistic understanding of cultural landscapes. Moreover, Phase 2 facilitates the dissemination of knowledge to local communities and administrations.

#### 2.2.3 Phase 3: implementation

The final phase, Implementation, is dedicated to the dissemination of information and tools to communities residing within or influenced by a cultural landscape. This phase entails a series of interactive engagements, discussions, and the actualization of projects aimed at the practical application of the project's insights.

### 2.3 Project context

In Romania, there exists a pressing need for the kind of comprehensive territorial approach embodied by this project. The concept of a cultural landscape is increasingly discussed, yet there is a notable absence of a well-defined inventory methodology and a systematic process for their identification. Moreover, even when these initial phases are undertaken, there remains a dearth of individuals who fully grasp the significance of a cultural landscape and the

profound importance of considering its broader context.

The selection of the Romanian Banat region as the focal point of this study is a deliberate choice, motivated by several compelling factors. Banat boasts a diverse natural landscape, characterized by its multi-ethnic and multi-religious composition, and a rich heritage stemming from a history marked by the succession of various forms of political leadership. This region offers a unique tapestry of context, and the endeavor to analyze this context and illuminate its inherent values serves to enrich our collective understanding of the environment in which we reside. The ability to connect with a given context enables a deeper integration within it, fostering resonance with its intrinsic values, and ultimately motivating a heightened commitment to their preservation.

## 3 METHODOLOGY

### 3.1 Methodology according to project phases

The basic methodology of the project is structured to cover all phases of the project, and concentrate on [4]:

#### 3.1.1 Phase 1 - Identification

- Boundary and transfer zone study. Boundary zones are areas where there is a multitude of contacts (culture, religious systems, complex ethnic structures and imperial systems), which also produce a multitude of perceptions and images.

Analysis regions: spatial perceptions and identities. Vernacular and formal elements, regions, conceptualization in traditional regions and the issue of spatial and/or regional identities/identity of a region.

- Natural and cultural heritage as part of the actual/potential base of tourist attractions. Identification and systematization of natural and cultural heritage elements as tourist attractions. Hierarchy of heritage elements in relation to their actual/potential meaning in tourism evaluation.
- Mind maps and imaginative geography. Concepts of spatial configuration and structure: attitudes to space, spatial preferences, identification and evaluation, spatial stereotypes.

#### 3.1.2 Phase 2 - Identity

- Semiotics and symbolism of landscape. Material signs of the process of examining history and applying the new heritage policy. Immaterial signs of the evolution of the territory.
- Spatial expressions of ethnic and religious identity. The role of spatial terms of reference in religious and ethnic relations. The degree of connection between social distance and physical distance.
- Multicultural identities

#### 3.1.3 Phase 3 - Implementation

- Tourism and recreational assessment of natural and cultural heritage. Representation of heritage elements in the tourist offer. Models integrating heritage elements in the tourist offer. Spatial implications of tourism and recreational evaluation of heritage elements.
- Legislation and policies that have been used to guide planning practice.

### 3.2. Detail identification methodology

The methodology in question starts with the following foundational principles:

- Comprehensive Material Inventory: This involves a thorough cataloging of the tangible components within the landscape.
- Definition of Landscape Scale: Deliberation on the spatial expanse of the landscape, the establishment of permeable boundaries, and the identification of neighborhood units.
- Consideration of Geographical and Natural Characteristics: An exploration of the geographical and natural attributes inherent to the landscape.
- Identification of Component Localities: The identification and analysis of both rural and urban settlements within the landscape.
- Analysis of Architectural Elements: An examination of architectural features that contribute to the landscape's character.
- Assessment of Agricultural Areas: An evaluation of the agricultural zones presents within the landscape.
- Characterization of Predominant Landscape Features: The determination of the primary landscape character, whether it is rural, urban,

industrial, natural, or other defining characteristics.

- This multidisciplinary approach, incorporating expertise from architects, urban planners, landscape architects, and geographers, forms the foundation for a robust methodology that aims to comprehensively identify and define these cultural landscapes or landscape systems.

The underpinning of this project draws extensively from an array of international documents, published works, and prior projects that have been executed in the Banat region. This substantial body of local literature and research serves as a crucial and advantageous point of departure for the endeavor.

### 3.3 Project team

The project was generated as a multilayered analysis of various landscapes. To be able to cartograph the various depths and meanings of cultural landscapes, a multidisciplinary team of professionals from different fields was assembled. The team members varied along the different stages of the project, but a solid core remained stable. Out of the team members, a vast majority were active or had previous involvement in the academic field.

The team comprised a geographer, multiple architects and photographers, architects specialized in history and urban development and landscape architects.

As a multidisciplinary team, our approach thus far has primarily centered on the augmentation of the tangible characteristics inherent to the territory.

### 3.4 Analysis indicators

Consequently, for the identification phase, our team has developed a methodology grounded in six pivotal indicators. These indicators have been meticulously devised to facilitate a comprehensive analysis of the territory, emphasizing pragmatic and unifying attributes:

- natural setting (refers to the existence of protected areas, biodiversity features, ecological infrastructure, vulnerability of the geographical landscape);
- hydro geomorphological character (presence of water and the form in which it is present, mineral landscapes, landform characteristics generated by the presence of water, current geomorphological processes);
- agricultural potential (perception of agricultural typologies, existence or non-existence of local products, animal breeding, degree of participation of forests in the landscape, importance of cultivated land);
- urban planning and territorial development (analysis of accessibility, analysis of the relationship between the natural and built environment, presence of valuable areas, urban-rural dynamics, housing typologies);
- heritage and architecture: quality of local architecture, presence of traditional architecture, specialized functional or technological typologies (designed landscape, industrial landscape – Fig. 1, vernacular/rural landscape – Fig. 2, urban landscape), existence of isolated elements that give character to the area, period of construction of the existing built heritage;
- intangible heritage (existence of festive events, presence of crafts, ethnic diversity).[5]

## 4 METHODOLOGY FOR THE DEVELOPMENT OF BANAT MAP

The creation of the cultural landscapes map for the Banat region (Fig. 3) involved a comprehensive process that integrated various vector datasets through the application of Geographic Information System (GIS) software, specifically ArcGIS 10.2.1.

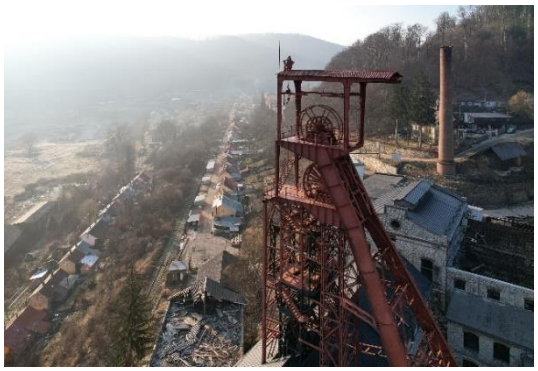

Fig. 1 Industrial Site Shaft 1 Anina, caraș - Severin County, Romania ©Peisaje Culturale în Banat

Fig. 2 Charlottenburg Village, Timiș County, Romania ©Peisaje Culturale în Banat

This approach allowed to identify and delineate homogeneous areas within the territory, focusing on key geological and geomorphological features (such as relief steps), climate conditions, and land cover and land use characteristics.

The following datasets were employed in this mapping endeavor:

- Boundaries of Landscape Units and Sub-units: These vector data, acquired from www.geo-spatial.org, provided the foundational structure for the map. Relief units and sub-units were categorized based on altitudinal gradients, effectively capturing the variations in climatic conditions and the distribution of land cover and land use classes. The application of the Merge function in ArcGIS 10.2.1 facilitated the amalgamation of several relief steps, enabling typological differentiation of the landscape (Fig. 3, 4, 5).
- Climatic Province Sectors: These sectors, representing two distinct climatic influences (oceanic and sub-Mediterranean) existing in the Banat region, were digitized from the Map of Climatic Regions and Topo Climates of Romania (*** 1983, Geography of Romania, Part I - Physical Geography, p.286).
- CORINE Land Cover and Land Use Data: European reference data sets for the years 2000 and 2018 were utilized for comparative analysis. These datasets, obtained from the European Environment Agency's website (https://www.eea.europa.eu/data-and-maps or https://land.copernicus.eu/pan-european/corine-land-cover), underwent coordination and reprojection in the 1970 Stereographic system, specific to Romania. The land cover and land use classes were categorized into three hierarchical levels, with level 3 being utilized for the map of cultural landscape types in the Banat region.[7]

The meticulous application of this methodology developed an initial draft of landscape units and sub-units within the Romanian Banat region. This identification process, coupled with the determination of dominant characteristics, serves as a crucial foundation for future in-depth exploration and understanding of the territory.

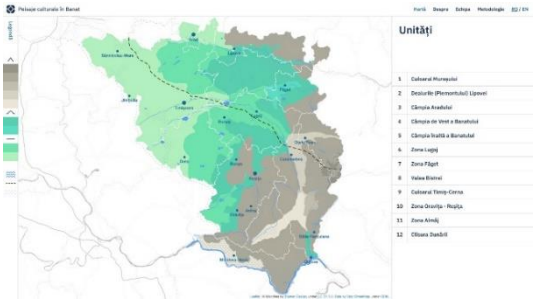


Fig. 3 Map of cultural landscapes units from Banat ©Peisaje Culturale în Banat

## 5 DISSEMINATION

Field research activities substantiated the findings from pre-2020 surveys, which served as pivotal guiding references for the comprehensive territorial investigation.

Building upon the insights garnered from both fieldwork and an extensive literature review, the objectives of the project's initial phase have been successfully realized. These achievements encompass:

- Cultural Landscape Map: The development of an online cultural landscape map detailing units and sub-units, accessible via the following link: https://peisaje-culturale.ro/en/harta.
- Online Platform: The establishment of an online platform serving as a repository for the cultural landscape map, select photographs, and the dominant features characterizing the territory, all in accordance with the methodological sheet. This platform, functioning as a dynamic database, will in the future be synchronized with data sourced from the archives of the Faculty of Architecture and Urbanism of Timisoara, the National Heritage

Institute of Romania, and forthcoming field research activities in subsequent project phases.

- Online Publication of Methodological Material: The online publication of methodological materials designed to facilitate the investigation and identification of cultural landscapes. These resources are accessible through the following platform: https://issuu.com/asociatapact/docs/gghi_metodologie_peisaje_culturale_issis.

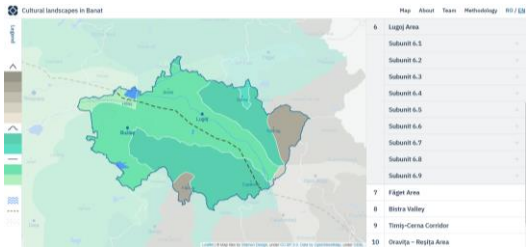

Fig. 4 Landscape Unit exemple (Lugoj area) ©Peisaje Culturale în Banat

- Engagement through Photo Exhibitions and Community Talks: The project has actively engaged with the community through photo exhibitions and community discussions, fostering a deeper understanding and appreciation of cultural landscapes.

## 6 TRANSFER OF KNOWLEDGE

This project is an experimental one, both in terms of its subject matter, team composition and coordination, the development of methodology, and its implementation at the Banat region level to assess its feasibility. For this reason, the initial stages of the project (2020 - 2022) were conducted by a multidisciplinary team of specialists who are well-versed in fields related to cultural landscapes.

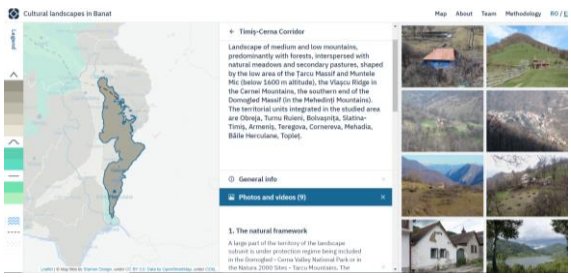

Fig. 5 Landscape Sub - Unit exemple (Timiș – Cerna corridor) ©Peisaje Culturale în Banat

Upon the completion of the initial draft of the map, the methodology, and the acquisition of substantial knowledge regarding the Banat region, the project shifted its focus towards transferring this knowledge to the younger generation of students, particularly aspiring architects. The project was further developed in within the *Faculty of Architecture and Urbanism of Timișoara*. This was accomplished through various teaching and discursive endeavors coordinated by G. Domokos–Pașcu.

### 5.1 Summer practice workshops

Summer practice workshop „Cultural Landscapes in Banat" developed during summer of 2023, coordinated by G. Domokos–Pașcu, dedicated to second-year students from the Faculty of Architecture and Urbanism in Timișoara.

During these student internships, fundamental concepts of landscape comprehension and interpretation were imparted, which the students then applied in clearly defined territories. Through these exercises, they were able to identify the visual boundaries of a landscape, its constituent elements, and the influence of determining landscape factors. Information was conveyed through sketches (Fig. 6), photographs, maps, and text.

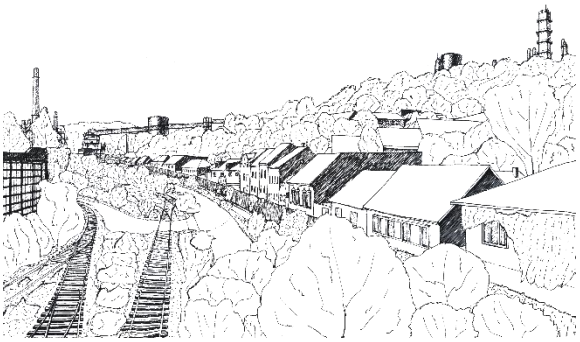

Fig. 6 Study sketch, industrial landscape Reșița. Stud.arch. Venicius Matzek, 2023 summer internship - Cultural Landscapes in Banat, FAUT.

### 5.2 Graduation project discipline

The discipline of the *Graduation Project* unfolds within the 11th semester and serves as a basis for the development of the graduation thesis, being structured in three sub-units, out of which

one, the *Reuse unit*, takes into consideration the concept of landscape.
Within this sub-unit, G. Domokos-Pașcu and M. Bâldea as tutors and part of the wider academic team, worked with groups of students that have chosen topics related to heritage and landscape. In relation to their specific topic of research, they were instructed in a general wider understanding of the components of a cultural landscape, such as identification and interpretation of various geographical, historical and heritage components, and the ties between them.

5.3 Graduation project coordination
Transfer of knowledge happened also in the coordination of a series of architectural graduation projects during the year 2022-2023. The projects, coordinated by G. Domokos–Pașcu, were developed in key locations within the Mountainous Banat region (Anina, Oravița, Bocșa), and implied research and analysis of wide land areas.
Within those projects, a finer degree of detailing in relation to the concept of cultural landscape was achieved, both from a teaching point of view as well as regarding the outcome of the analysis.

## 7 CONCLUSIONS

Through this experimental research, a notable revelation emerged: despite the absence of specific studies dedicated to cultural landscapes, a substantial body of territory-related documentation was identified, greatly aiding in their identification and inventory.
This multifaceted approach underscores the project's commitment to not only research and documentation but also active engagement with the community. Moreover, it highlights the integration of digital platforms to disseminate information, making it accessible to a broader audience and setting the stage for future phases of the project.
It has become clear through out common experience of professional practice and teaching during the last two decades that the mere preservation of individual constructions enlisted as heritage buildings and considering them as the unique embodiment of historic and cultural value does not truly mirror the real sense of place and cannot preserve the complex features of the cultural landscape. In this sense, disseminating the projects findings further within the academic environment and creating teaching tools built on this experience could lead to a substantial improvement of young architects understanding of the vast implications of cultural landscapes.

## 8 ACKNOWLEDGMENTS

We want to express our acknowledgements to the Cultural Landscape project team (2020 - 2023): Alexandru Todirică, Teodor – Octavian Gheorghiu, Mihai Danciu, Diana Belci, Raluca Rusu, Alexandru Ciobotă, Ana Ianăș, Ovidiu Micșa, Ana - Maria Branea and Attila Domokos.

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# Curriculum

# Why Integrate the Study of World Heritage Sites into the Curricula of Architecture Schools

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**ABSTRACT**

The study of historic settings, particularly those included in the World Heritage List due to their specific requirements, presents an immense pedagogical value for the formation of architects, beyond traditional disciplines of history of architecture and urbanism, or heritage conservation. Viewed through the lens of the theory of 'learning through discovery,' heritage sites are not only simple vestiges illustrating the past, but sources of new experience for architecture students. They represent a starting point for the discovery of historical processes and internalisation of contextual determining factors of the site; from this point of view, they fulfil an important heuristic function in the teaching of architecture.

Direct observation of archival documents, as well as careful investigation of historical vestiges on site, help students to identify and document the important moments in the historical development of the site, to investigate in detail and analyse, to formulate and challenge hypotheses, to make critical assessments and deduce facts, to understand in depth objective attitudes and scholarly reasoning. The in-depth study of historical settings through on-site and archival research gives an active character to the learning of history, with a more intense pedagogical experience. Students participate with interest and curiosity in the study of documents and buildings with historical value, and new knowledge is formed because of their own effort to discover and interpret historical data, going far beyond a simple record of historical data as communicated by tutors and secondary sources.

This article discusses the pedagogical context and outcomes of a project that featured an international and interdisciplinary workshop approach to a particularly complex heritage site currently under consideration for inclusion in the World Heritage List, Heroes' Path monumental ensemble by Constantin Brâncuși in Târgu Jiu, Romania. This teaching experience has an excellent potential for enhancing the students' approaches to architecture and design creativity.

**Keywords:** World Heritage, architectural education, on-site research, teaching methods, workshop pedagogy

## 1 INTRODUCTION

Heritage is "an exercise of intellectual, aesthetic, and civic mobilization" [1], which means that the idea of heritagization is, in fact, an exercise that must enable people, communities to understand, appreciate and respect all that can be considered heritage.

Following increased interest from the cultural-artistic and economic-touristic fields, since the 1960s, faculties of fine arts at first have introduced in their curricula of theoretical and practical specializations the study of principles and techniques of conservation and restoration, followed by schools of architecture but mostly at postgraduate level. Italy is a notable exception where the formation of the architects at undergraduate level has included for a long time, seamlessly in their curricula substantial elements of heritage conservation training.

The 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) has constituted and continues to constitute an interdisciplinary focus of research due to its wider implications for architecture and urban planning, tourism and economy, and international law [2]. Also, since 1995, the Forum UNESCO – University and Heritage international network has fostered the study of sites inscribed in the World Heritage List leading to the establishment of dedicated World Heritage Studies courses in universities, including in schools of architecture [3].

Currently, the main mission of the postgraduate Conservation and Restoration specialization in architecture schools is focused on: preparing for the practice of conservation and restoration of architectural heritage; introduction of scientific knowledge of the various fields related to conservation and restoration; the training of architecture professionals with complex competencies, able to actively participate in the supervision, conservation and restoration of structures belonging to the national and international cultural heritage; promoting cultural values related to national specificities [4] [5].

The project presented in this article set out to advance traditional teaching methods in architecture and conservation by immersing the students in an international and interdisciplinary workshop approach to a particularly complex heritage site currently under consideration for inclusion in the World Heritage List.

## 2 CONTEXT

Historic structures, works of art and architecture, that are considered to have unique characteristics of Outstanding Universal Value – and thus inscribed in the World Heritage List – require appropriate technical conservation approaches to ensure their long-term preservation. The nature of their nomination process means that these heritage sites have benefitted already of significant research that is available in English and other languages, making them particularly useful for international cooperation in architectural education.

On the other hand, the context in which these constructions are located has evolved over time being mostly occupied by densified, modernized, industrialized human settlements. These contemporary realities of the context in which heritage structures are situated, are most often in conflict with conservation requirements of the fragile nature of urban heritage, which requires us to know in depth and find that balance between the two realities [6, 7]. The protection of World Heritage sites and their Buffer Zones requires urban planning regulations that impose development prohibitions and functional limitations to ensure the safeguarding and enhancement of their Outstanding Universal Value.

Considering the historical perspective of interventions in historic urban fabric, in the era of the Industrial Revolution, a century and a half ago, as the industrial city marked the end of the medieval city, the new urban entity had become uninhabitable. At that time, the architects found themselves unprepared to face this task, which should have been, after all, so familiar to them. It was only two generations after the onset of the city's crisis, that the Modern Movement [8] seemed to succeed in repositioning the architectural profession in relation to the new industrial urban realities, paid for with the price of Alberti’s ideal [9] evolved in Claude Perrault's

classicist version [10].
Today, the habitation of cities, new and old, is once again plunged into a complex, unprecedented crisis, the ecological crisis. Architects, even the most gifted with talent, remain inert even now, trapped in the narcissistic fascination of the art of building, ignoring for the most part the cultural and historic context of cities, like their nineteenth-century academic predecessors [11].

## 3 METHODS

If we look at the constant analytical interest aroused by the sustained research of buildings belonging to the past, increasingly sophisticated, we live in an era of historicization of contemporary architecture. It is a significant evolution that means more than the displacement of temporal perspective, it appears rather as a premonition of a genuine reflexive paradigm shift. This kind of approach, usually reserved for eras considered over, now addresses ongoing architectural phenomena.
The solution offered by J. Dewey according to the principle that life is agency, not work-on-command, and for this reason the school must adopt the same principle, underpins the learning by doing teaching method, which immediately finds application in the modern pedagogy of 'learning through discovery' of this project [12, 13].

### 3.1. Choice of project

The 2022 Lived-in Heritage workshop in Târgu Jiu, Romania had as study objective the monumental ensemble Heroes' Path by Constantin Brâncuși (1876-1957) and was carried out in three stages, online, in-person and hybrid, as following: introduction of the argument of study and mutual knowledge exchange between participants, study visit and exploration of the site, presentation of analysis and proposals to address the issues identified [14].
We proposed to the participating students, from architecture schools in Romania, Scotland and Ukraine, the evaluation of the urban conservation issues faced by this heritage site.
The Monumental Ensemble of Târgu Jiu has been on the World Heritage Tentative List of Romania since 1991. It was formally submitted for evaluation by ICOMOS in 2014, rejected, re-submitted in 2018 [15], and since then it has been on hold, alongside other war memorials proposed by France and Belgium, until a decision is taken regarding the suitability of such sites for the World Heritage List. The moratorium on the evaluation of sites of memory associated with

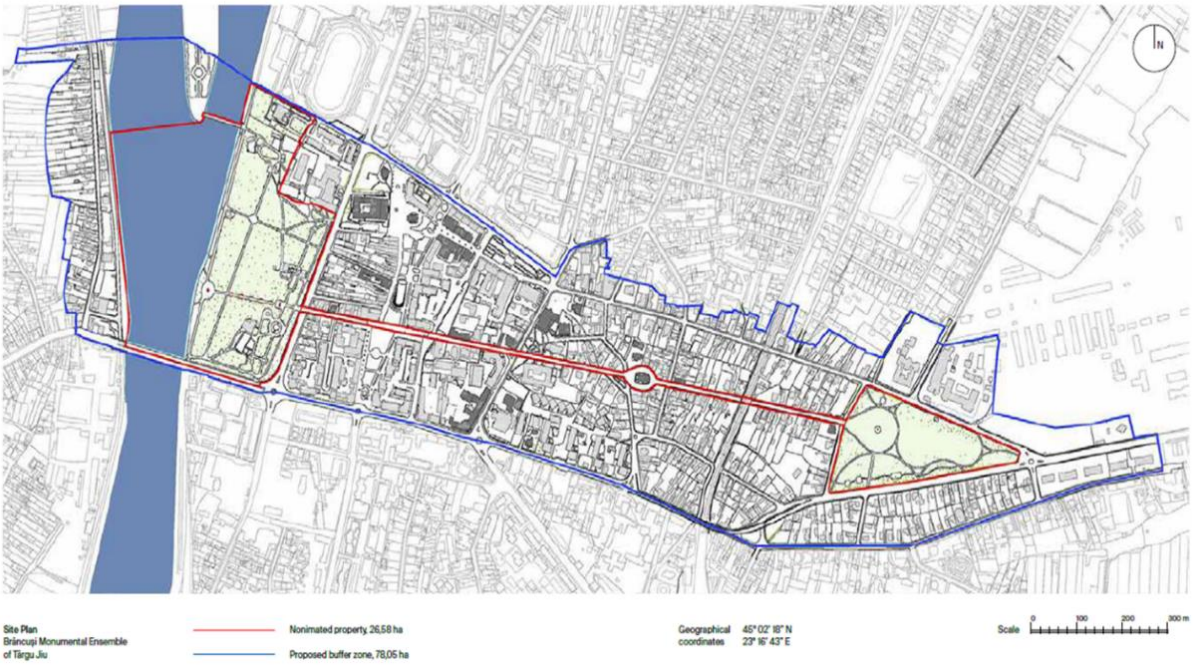


Fig. 1 World Heritage Site and Buffer Zone proposal [15]

recent conflicts has just been lifted at the last World Heritage Committee in September 2023, re-opening the process of evaluation of these nominations [3].

The proposed World Heritage Site in Târgu Jiu is an ensemble of five interrelated sculptural installations aligned on a virtual 1.5-km-long axis superimposed on the Avenue of the Heroes in central Târgu Jiu. These solemn, meditative, yet accessible architectural sculptures were created in 1937-1938, commissioned by the National League of Gorj Women to honour the Romanian soldiers who died defending the city in 1916.

Designed and executed by Constantin Brâncuși, an influential pioneer of abstract sculpture, the installations consist of the circular limestone Table of Silence, with 12 stone seats surrounding it; 30 limestone stools that line the Alley of the Chairs; the Gate of the Kiss, an austere travertine portal; two stone benches flanking this portal; and, almost 1.5 km to the east, the Endless Column, a slender 29.35-m-tall metal shaft. The Church of Saints Apostles Peter and Paul, built in 1927, has been intrinsic to Brâncuși's composition (Fig. 1).

The ensemble has been hailed as one of the great works of twentieth-century public art, but a significant particularity of the ensemble is that form an urban discourse that across the central area of the city, spatially unifying the bank of the River Jiu with the eastern outskirts of the city, where the Endless Column has been placed in an epic setting on the fringe of the town, now an open parkland (Fig.2) [16].

### 3.2. Project organisation

In the first stage of the project, student presentations of academic and professional projects related to the topic created the group synergy necessary to accelerate the students' accommodation with working in international teams: Timișoara, Apoș, and Arad (Romania); Chernivtsi (Ukraine); Edinburgh, and Inverkeithing (Scotland). These projects discussed historical elements, inventory of exceptional features of urban or natural landscape, details of the evolution of the local built fabric and their relevance for heritage conservation [14].

In the second stage of the project, on-site, the international student teams focused on a research theme to develop proposals for the integrated urban conservation of the monumental ensemble Heroes' Path in Târgu Jiu. For this activity, the learning process covered simultaneously investigative and practical application activities, subordinated to concrete tasks of soft skills formation and knowledge exchange between participants and faculty, as well as peer-to-peer. Students thus begin to learn from direct research and practice on a concrete objective, to acquire scientific processes directly connected with practical activity. The third stage consisted of an online workshop where the student teams gave final presentations of their work and discussed their findings with teaching staff.

Fig. 2 World Heritage Site and Buffer Zone proposal [15]

### 3.3. Implementation of work stages

The on-site workshop required the involvement of each student, individually and within teams, through all the decisive phases, necessary for the project stages, such as documentation, field visits, formulation of hypothesis, specialized investigations, and collaboration with other specialties, drawing conclusions and proposals for intervention. The development of activities took into consideration the familiarisation with the site and its contexts (visits and local talks), investigation of lived-in heritage from Târgu Jiu in mixed teams from the three universities (historic data, surveys and interviews, photography, video), presentation of preliminary findings to the local community [14]. One of the most important elements in assessing the cultural significance of the Ensemble of the Heroes' Path is its urban nature: it has been

conceived by Brâncuși as an urbanism intervention in the natural setting of Târgu Jiu, as well as the existing urban fabric of the city, incorporating as intrinsic elements of the design the Jiu River and the Church of Saints Apostles Peter and Paul. Since the ensemble was built, the city has developed further and the protection and conservation of the site should be integrated with the urban conservation of the wider area, challenging the current perception that the ensemble is merely a group of monumental art [17,18]. Confronting complex situations, in the case of sites inscribed in the UNESCO World Heritage List, triggers a special mental stimulation, invites research, the project execution increases confidence in one's own skills, brings the student closer to the complexity of topics encountered later in his professional career, contributes to the maturation of thinking (Fig. 3).

Fig. 3 The students visiting the study-site for the project

The awareness that the results of the project are useful later, makes this combination of research and direct application meaningful in the eyes of students, becoming a source of motivation for personal development.

The projects focussing on sites inscribed in the UNESCO World Heritage List are suitable for students who have already completed at least the first 4 semesters at the architecture school and have a sound initial architectural education basis, whilst being in a period of maximum receptivity in which enthusiasm, creativity, and the desire to affirm are very strong. Engaging in these projects gives students the confidence to be able to engage in projects and work independently, to capitalize on their creative capacities, cultivate projective thinking and action based on foresight and calculation, become accustomed to research strategy and learn to hypothesize causes and cause-effect relationships under investigation, examine and meditate, express points of view using scientific technical terminology and formulate ideas, hypotheses, conclusions in writing.

### 3.4. Activity Assessment

In carrying out the project, it is important to stimulate the students' effort, encourage the initiative to solve tasks, choose working methods, establish material means, self-control of results and present conclusions and proposed solutions, making them feel responsible for the approach.

The role of the teacher, although difficult, is to be present during the students' efforts to ensure that the students' intentions do not fail in front of the difficulties encountered along the way and to ensure the coherence necessary to go through the stages of work. The teacher's guidance is not permanent, and it is not necessary to communicate his own opinions, having the role of consultant and referee in the students' decision moments. At the launch of the project, the teacher will analyse with the group of students all the details of achievement, the inherent difficulties to go through, the facilitation of critical analysis and foreshadow how the activity will be completed – the final evaluation.In all phases of execution, the teacher collaborates with the students, but does not replace their activity. Once the project is completed, one can objectively observe the evolution and good theoretical and practical training of each student, besides testing the intellectual capacities and creative skills of each, the will to do, socio-moral attributes – spirit of cooperation, team, honesty, as well as scientific, technical, organizational, managerial skills [19].

### 3.5. Activity results

In the second part of the project, the student teams, supported by teaching staff, were asked to focus each on a research theme to develop proposals for the integrated urban conservation of the monumental ensemble Heroes' Path in Târgu Jiu. The four themes were defined to

characterize the ensemble within its urban setting:

- the relationship between and natural elements of the site (Fig. 4),
- the skyline of the site and impact of 1970s-80s developments (Fig. 5),
- the fragmentation of the site by the railway and Constantin Brâncuși Boulevard/E79 road (Fig. 6),
- the threshold condition along the proposed World Heritage site boundary and its buffer zone (Fig. 7).

The themes were considered within the site's historical, social, and artistic context and reflecting the importance of the creator of this ensemble, master Constantin Brâncuși. The students working under the supervision and with the collaboration of teaching staff, identified and evaluated the impact of each of the dimensions, tangible and intangible, covered by the given themes.

This is an intrinsic methodology to the study of lived-in, dynamic heritage settings [20]. The compositional elements of the Heroes' Path ensemble were considered alongside those of the historic urban fabric of Târgu Jiu as indivisible parts of the same setting, resulting in a complex, multi-layered cultural significance of the site. The project concluded with a series of theoretical proposals and recommendations: lived-in heritage dimensions, cultural landscape vs. cultural and/or natural heritage designations, methodologies for engaging communities in heritage research/decisions [14].

The discussion that ensued revealed the close attention paid by the students to many details that helped them comprehend a complex urban heritage situation which was new to them (even if some may have been familiar with the ensemble and the city). They were able to synthetise their findings showing critical thinking, select specific elements for proposals and support these with brief, illustrated precedent studies.


Fig. 4 Study of and natural elements of the site

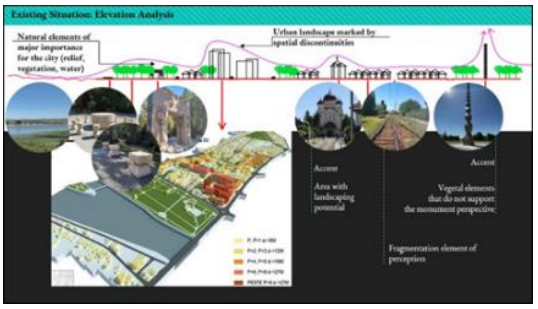


Fig. 5 Skyline study of the site

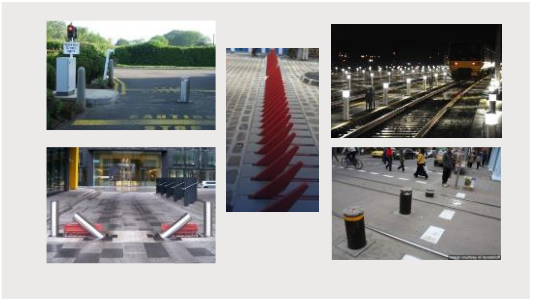

Fig. 6 Precedent study and proposal for addressing the fragmentation of the site

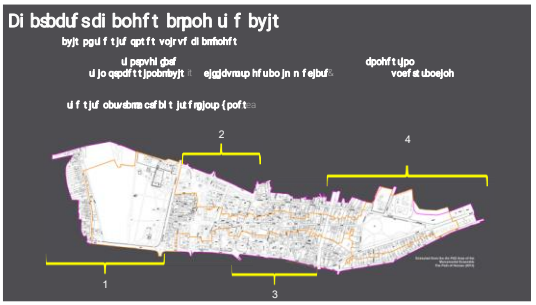


Fig. 7 Study of the threshold condition along the site

### 3.6. Benefits and challenges

The in-depth study of historical settings through on-site and archival research gives an active character to the learning of history, with a more intense pedagogical experience. The main benefit of this teaching method is that students participate with interest and curiosity in the study of documents and buildings with historical

value, and new knowledge is formed because of their own effort to discover and interpret historical data, going far beyond a simple record of historical data as communicated by tutors and secondary sources. This teaching experience has proved rewarding and has an excellent potential for enhancing the students' approaches to architecture and design creativity.

This pedagogic method has challenges too, as the students come from a variety of cultural backgrounds, and this influences group dynamics, and indirectly project work. Also, the number of students participating in such a project must be limited in order to ensure the quality of the experience through direct access to both sources and teachers' advice. This means that the efficiency of project organisation and teaching methods varies depending on the student group composition. This can be mitigating by allowing some flexibility within the teaching methods to respond to such fluctuations, without diminishing the project experience.

## 4 CONCLUSIONS

The introduction in the curricula of architecture schools of projects, having themes of conservation and restoration of the objectives inscribed in the World Heritage List, leads to increased empathy for regional history and heritage, better understanding of the typologies of the local built fabric, as well as understanding the need for interdisciplinary approaches to specific issues, for which a student's limited knowledge does not allow an efficient detection of solutions, and provides an incentive for future professional development [21].

The themes of concern that inherently result from such an experience remain always relevant, enhancing our knowledge of heritage conservation and management with each case-study:

- Revision of specialist terminology and codes of ethics in the field, such as principles, norms and regulations involved in scientific investigation and conservation interventions [22],
- Determining urban historical contexts in the same way as individual cultural heritage assets,
- Study of the effects of man-made deterioration and degradation, including that of climate change,
- Re-assessing the fundamental aspects related to the purpose, role, and functions of heritage,
- Development of methods used in the valorisation of cultural heritage assets by co-assisting and corroborating analogue and digital techniques,
- Assessing the impact of the community on the evolution of a lived-in heritage site and devising ways of attracting and engaging it through participatory conservation and valorisation,
- Quantifying the benefits of conservation and enhancement in the management of historical monuments and sites.

Whilst such workshops may seem too short-term to have any bearing on students' architectural education, their intensive, immersive, interdisciplinary, and international character, as well as the direct collaboration with teaching staff within the teams, ensure a much higher impact on their professional development.

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Whilst the project has been developed from a pedagogical and specialist content point of view by the authors, its successful implementation has been only achieved due to the enthusiasm, dedication, and ingenuity of the teaching staff and students from the three universities: The MSc in Restoration and Heritage Regeneration and PhD programmes of the Faculty of Architecture and Urban Planning at Politehnica University Timişoara, the MSc in Architectural Conservation of the Edinburgh School of Architecture and Landscape Architecture at The University of Edinburgh, and the BArch programme of the Department of Architecture and Conservation of UNESCO World Heritage Sites at Yuriy Fedkovych Chernivtsi National University (full list of names on the project website [14]).

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# Teaching engineering subjects to architecture students. Opportunities and challenges

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**ABSTRACT**
Teaching after the pandemic time represents a big challenge in the universities, as it needs adapted teaching methods and skills to be able to capture and keep student's focus. Architecture faculty is based mostly on applied activities, laboratories, and projects, while the theoretical classes have the main purpose of giving the necessary basic information for this project and to develop a critical thinking component in the students learning process. Some topics, which are mostly related to civil engineering or installations, represent a challenge for the most creative students, as they request logical thinking. Teaching such disciplines for the architects comes with needs, so they understand not only the content of the lessons, but also the aim and purpose of having basic engineering knowledge.
This paper presents the structure of a basic engineering class in the architecture school, in the year of 2023, and the way in which the instructor needed to adapt the teaching methods to keep the student's focus. Moreover, it presents the topics of the seminary activity, which had the aim of fixing the information and helping the students to deeply understand the theoretical subjects.
In the Faculty of Architecture and Town Planning of Timisoara, students follow courses for a period of six years. The first four years are related with general approaches and classes, while the last two years have the purpose of allowing the students to choose a study direction, such as urban planning, restoration and rehabilitation of historical buildings, or complex architectural design. While the last two years are organized around classes that focus on the chosen topic, the first four years allow the students to gain important information and knowledge with a holistic architectural approach. Not only, during these general years, the students follow a series of engineering topics and classes, with the main purpose of allowing them to also have a technical approach of their projects, to develop their technical language and to provide essential knowledge for a future collaboration with professionals in the field, especially structural engineering. One of these topics is the course of Basics of Construction, which is teached in the first year of architectural studies and provides the students the most basic information about the building materials, techniques, and systems, and to help them understand the link between architecture and structure.
This paper presents an objective analysis of the opportunities that such an engineering class has in an architecture school and highlights the challenges that the instructor had during the 14 weeks of teaching and working with the students, so the methods can be improved until next university year. Specific practical exercises during the seminary activity are presented, considered as enhancing the learning experience of architecture students.

**Keywords:** architecture, teaching, engineering, opportunity, challenge

## 1 TEACHING IN ARCHITECTURE SCHOOLS

One of the most recent phenomena in the teaching process of architecture and engineering is the one of the more research-focused approaches, as new resources become available. The core of the architectural teaching are the theoretical disciplines with related underpinnings, such as paradigms and concepts [1].

From a long time ago, in architecture schools, there was also the necessity of finding the link between theory and practice and the most recent examples showed us that one of the best ways to do so is by allowing students to work on real projects. In this way, students are allowed to explore the nature of the problem and to offer solutions that are based not only on theoretical knowledge, but also on a specific analysis. That is the part in which the disciplines that have both course hours and seminary hours become important, as they allow the students to gain theoretical knowledge, but at the same time, to apply it to specific real exercises. This way, students can develop more creative ways of thinking, based on the ability of analyzing real issues and discover real solutions [2].

One of the most successful teaching strategies in the schools of architecture is the integration of the theoretical and practical courses into design studios, as the first ones should provide the student with the necessary information and thinking for a holistic design product in the end [3]. A study that was made at Bilkent University showed that the connection between design studio and all other disciplines can be made at two different levels. The disciplines that focus on theoretical, historical, or social topics are considered to be of secondary importance for architectural students. But disciplines the focus on technical knowledge, which is the case of the Basics of Constructions course, hereby presented, are considered highly significant [4]. Moreover, there is considered that courses related with building design, structural understanding and technical knowledge play a dominant role in the process of creating holistic projects in the design studios [5].

This paper presents the theoretical and applied activity that was carried out during one semester of Basics of Constructions discipline, which is teached in the first year of architectural studies. The aim of the course is to offer knowledge, to familiarize students with technical aspects of the design process and to increase their awareness of special issues related to architecture [6]. This type of course and seminary activity represent one of the base elements of the spine in architectural education (Figure 1) [7].

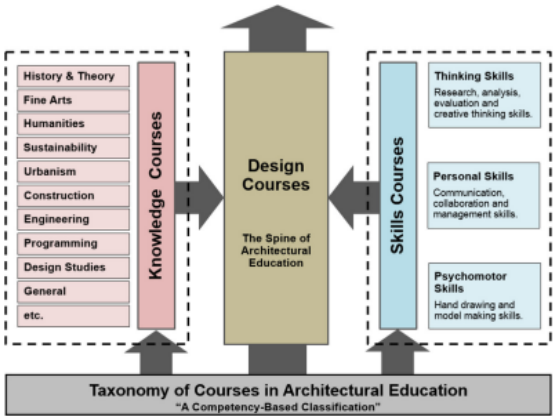


Fig. 1 The taxonomy of the disciplines in the architectural education process [7]

## 2 COURSE ACTIVITIES

The „Basics of Constructions" discipline starts in the second semester of the first year of architectural studies, following a previous course of „Construction materials", which aims to make the students aware of the various types of building materials, as part of teaching the fundamentals of the core of architectural knowledge [2].

The length of the course is two semesters, so a total of 28 weeks of information regarding the general issues related with constructions, as well as knowledge about most common building systems and elements that represent parts of the future building [8].

The first of the two semesters approach the topic from a general point of view, and it represents the part of the discipline that is described in the present paper. The activity is divided into 14 weeks of study, and every week there are two hours of teaching classes, followed by one hour of seminary activity, which will be described in the following section.

The structure of the teaching activity is the following:

- General issues related to constructions.
- Information regarding types of possible loads, efforts, and structural behavior
- The foundation ground.
- Types of foundations
- Waterproofing
- Walls – building systems, materials, types and issues.
- Technical language and specialized terms.

The first chapter of the course is also the most important one, as it offers the knowledge to better understand which are the main characteristics of each construction, such as destination, constructive system, loads and others. The students are introduced into a first classification system for the future buildings that they will design, learning that each building can be classified according to its functional destination, its bearing system, fire resistance and building system. As future architects, the students must learn not only about residential buildings, but also about other type of civil constructions, such as libraries, cinemas, theaters, office buildings, religious buildings and others, meaning that they should have knowledge also about structural systems for building with larger openings and various functional necessities. Moreover, the course allows them to receive their first general information about industrial buildings as well, or even bridges. Since nowadays, there is an increased interest for the functionalization of the industrial patrimony, the course aims to make the students aware of the specific of the construction system and particularities of several industrial sites, such as water towers or cooling towers, that could be transformed in the future into museums or multifunctional spaces.

The students learn also about the consisting elements of a typical structure, both linear ones, or bidimensional or even tridimensional elements, understanding that each construction is set up starting from a very clear building system, which is usually made from foundations, walls, slabs, and roofs. They learn about the different types of building systems, such as the wall system, or about the frame system or even some specific special systems.

One of the parts on which the course focuses the most is the part of foundations, as the students should understand the principles of applying various loads on specific ground types, with the aim of being able to discuss with the civil engineer and the soil engineer as well. Moreover, they are teached how to be able to recognize the cracks from different settlements at existing buildings, and to design to avoid future negative effects on their building and the existing ones in the neighborhood (Figure 2) [9].

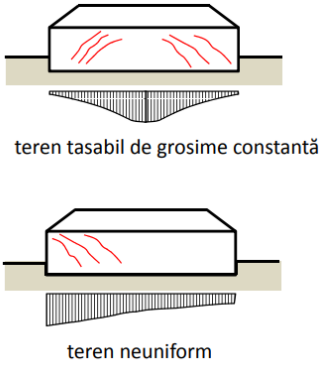


Fig. 2 Presentation of loads distribution in the foundation soil (from the course) [9]

The course presents the most common foundation types, both isolate (Figure 3) and continue (Figure 4), with general information about the necessary dimensions and materials [9].

The course introduces the students also in the topic of insulating materials, with the first discussions about how they should protect the interior space from water, moisture, and mold (Figure 5) [9].

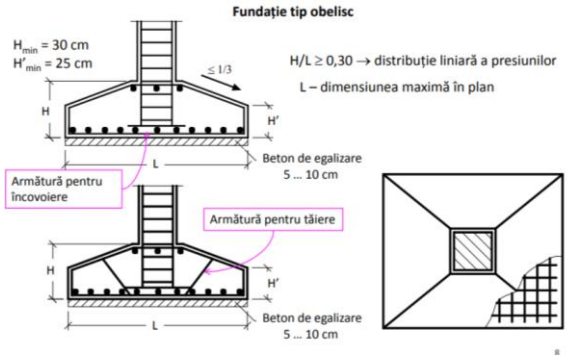


Fig. 3 Presentation of isolated foundations (from the course) [9]

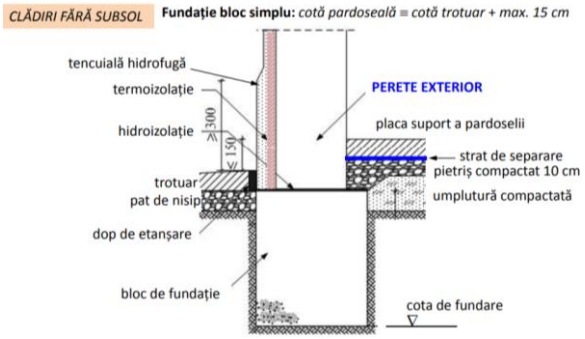


Fig. 4 Presentation of continuous foundations (from the course) [9]

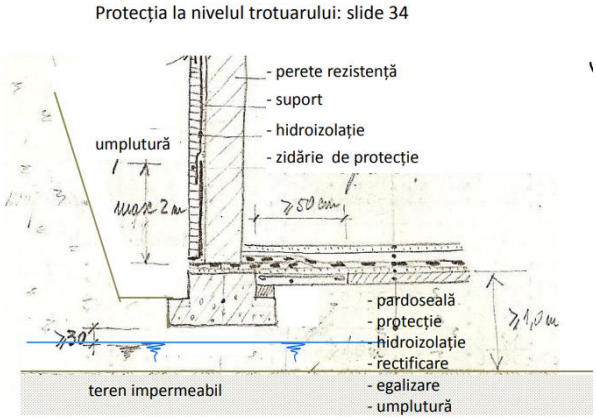


Fig. 5 Presentation of insulating details (from the course) [9]

The second most important chapter of the course is the masonry one, as masonry walls represent an aspect that students deal with in the future year, both in terms of partitions, but also in terms of aesthetics of the masonry materials. This chapter is formed of three teaching hours, in which students learn about various masonry materials, how the mechanical characteristics of each one, how those materials could be layered up in various aesthetic ways, and how nowadays materials are able to improve also other characteristics, such as the thermal insulation one. Moreover, the students learn how to operate with the most common building system in Romania, the load bearing masonry, and where they should put the reinforced concrete columns, to obtain the best results in terms of resistance, without affecting the architectural partition and interior space.

Moreover, the last hours of the course are dedicated to a discussion about the specific technical language that architects use, and to the understanding of the first technical aspects that will become usual in the design studio of the next year, such as how to calculate the built area (Figure 6) [9] and the urbanistic indicators and others. As design studios represent the most important part of teaching education, there is important that all the other theoretic disciplines are correlated with the first one. The design studios are based on three teaching pillars, such as teaching and learning methods (where the discipline of Basics of Constructions comes to support the design studio), assigned tasks and design communication techniques [10].

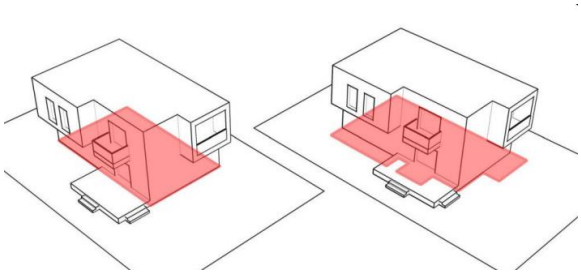

Fig. 6 Built surface are (from the course) [9]

After the pandemic period, there were necessary changes in the teaching process of this discipline. First, there was noticed the lack of attention from the students, for more than 30 minutes, so after each 20 minutes of course, there was introduced video material. This way, the stimulus from the teaching class changes every half hour, and the level of attention from the students has increased. The second change was the introduction of more visual parts in the courses, such as more drawings, especially tridimensional ones, as there was noticed the fact that students after pandemic times, are more prone to remember visual elements.

## 3 SEMINARY ACTIVITIES

This special academic tool, the seminary activity, has the aim to allow the students and the tutor to follow together a specific issue, to interpret it and critically discuss it, to solve problems and to apply the theoretical gained knowledge under the guidance of the teacher [2].

During the 14 weeks of one-hour activity, the students had two major tasks, both related to the theoretical course topics. Both tasks were

done in teams of 3 or 4 students, so the workload was divided between all of them.
The first assignment was related to the understanding of the foundation types and dimensions, as the students received a specific real situation of case-study building and they had to identify the best foundation solution. Moreover, with the help of the tutor, the students had to understand the general dimensions of the selected type of foundation and to draw it. Some drawings made by the students during the first hours of the seminary activity are presented in Figure 7.

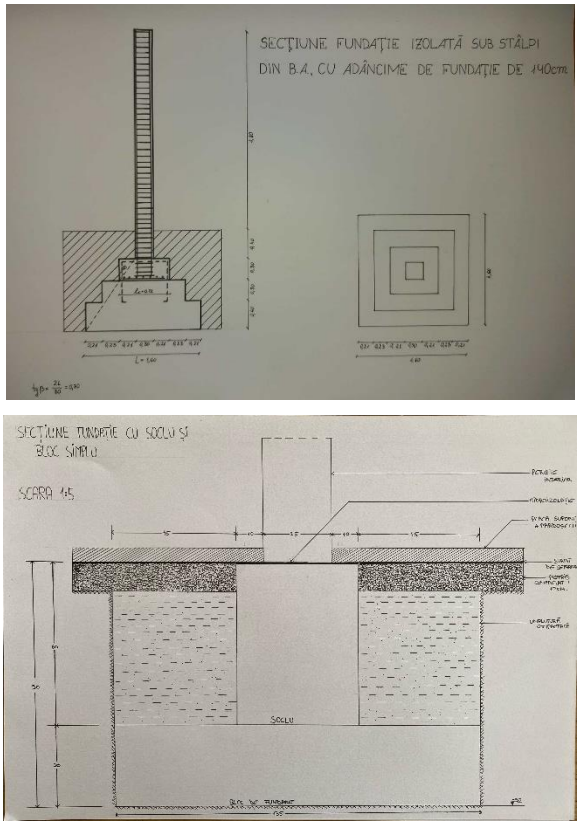


Fig. 7 Foundation drawings made by the students during seminary activity.

After the students did the calculation and the drawings, they had to prepare for the part of the tridimensional model. First, they had to design the formwork of the foundation and to create it from extruded polystyrene, which was an interesting process, as they had to critically think and to find solutions to create the negative of an object that didn't exist yet. The process of creating the formwork is illustrated in Figure 8.

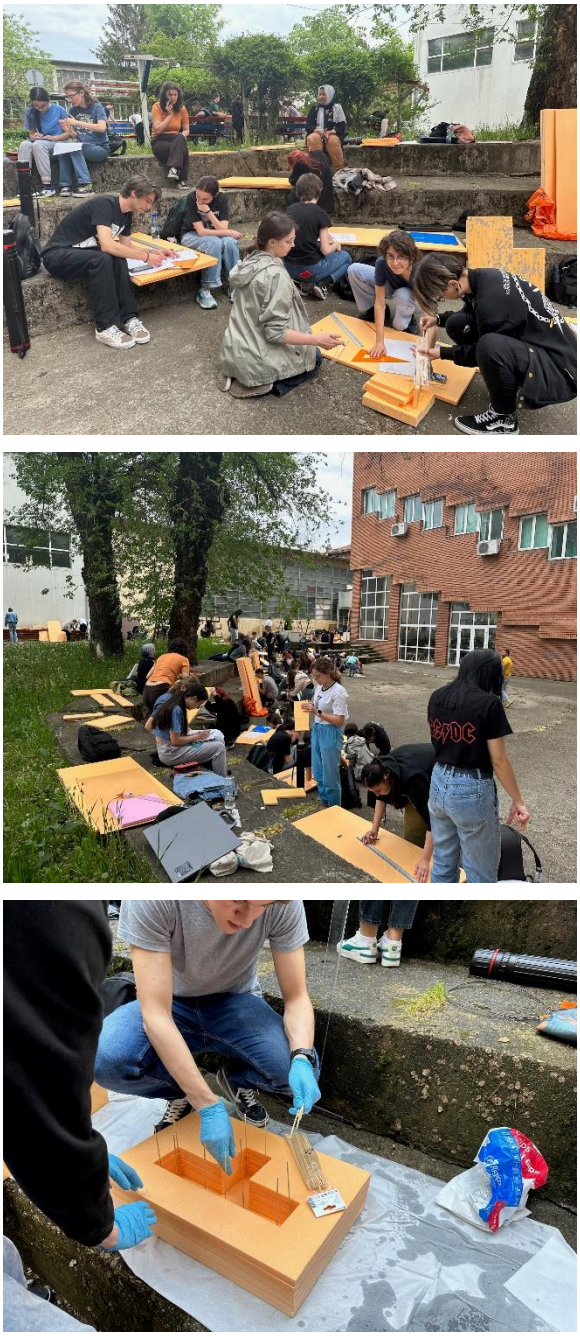

Fig. 8 Photos from the moment of designing the formwork for the future foundation model.

The next part of the seminary activity was to prepare the concrete and to pour it into the formwork that they already prepared, with the aim of obtaining a scale model of the foundation that they calculated and drew in the previous hours. The students received a list with all the necessary items for this activity, and they started to play with the concrete material, which

represented one of the most interactive steps of the semester activity (Figure 9).

Fig. 9 Photos from the moment of making the scale foundation model.

The problems that students had during this step were related to two aspects. First, in some cases, the formwork was not stable enough and it became deformed now of the concrete pouring, putting the students in the situation of finding a quick solution to the problem. Second, some of them had some problems when mixing the materials, as the concrete became hard too soon, not allowing them to pour it into the formwork. In this case, they had to start again with all the steps.

The last step of this exercise was made one week after the pouring step, as the students had to allow the concrete materials to become hard enough. During this last step, the students had to remove the polystyrene formwork and to finish, as much as possible, the concrete model of the foundation. Only at this moment they were able to see the results of their work from the past weeks, as presented in Figure 10.

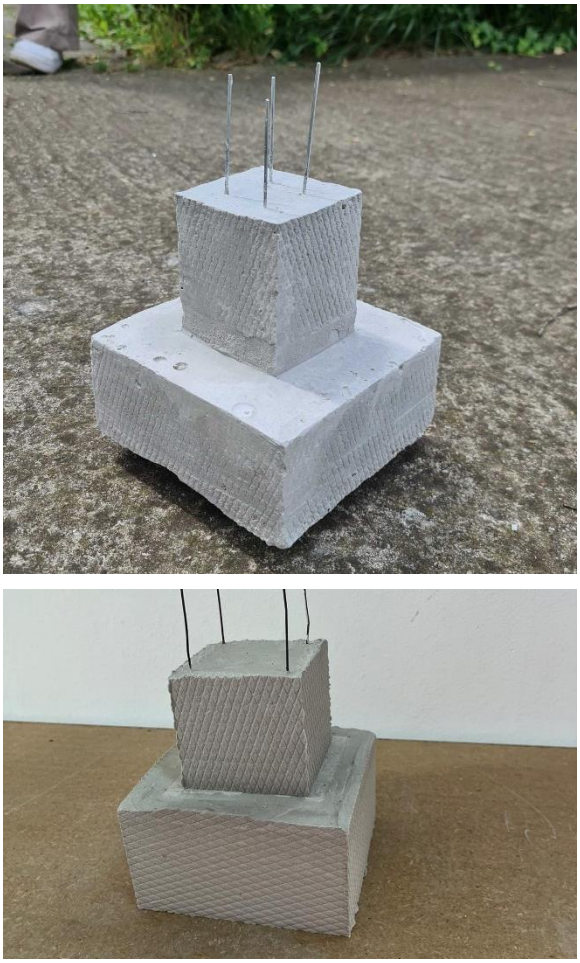

Fig. 10 Photos with the final scale foundation model.

The second exercise of the seminary activity was related to the chapter of masonry, as the students had to design a small house plan, on ground floor, with a maximum 10x10 meters plan. Based on the shape that they proposed, they had to decide the best positions for the reinforced concrete columns, and to justify their decision. For this exercise, the output of their work is represented by bidimensional drawings, with real scale models, as the time of the seminary activity didn't allow it. Some photos of their final drawings are presented in Figure 11.

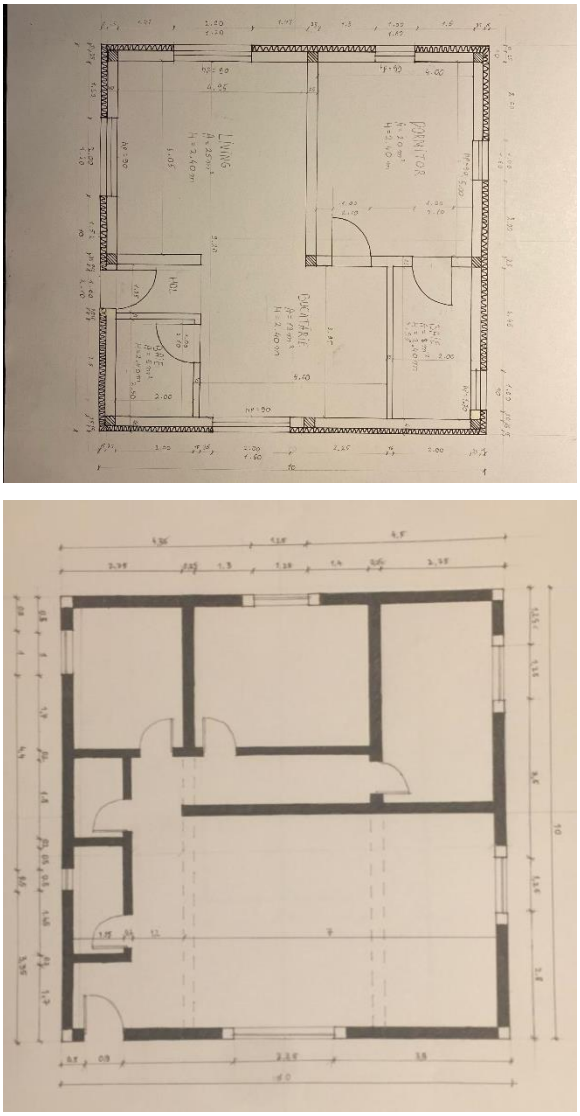

Fig. 11 Photos with the drawings of the load bearing masonry structural system.

In the end, the students were gathered to discuss all the results of the applied activities, understanding better the challenges and limitations of the Basics of Constructions discipline.

## 4 CONCLUSIONS

The 14 weeks of theoretical and seminary activity within the course of Basics of Constructions represented a useful tool for the first-year architectural students, which allowed them to gain knowledge in the field of technical thinking.

The conclusion of the work was that after the pandemic time, the students needed more visual stimulus to be able to focus for an entire teaching hour and responded better to the applied activities in which they had a real-life situation.

In conclusion, the curriculum of the activity should be further improved to address the changes in the student's behavior, but also to address better the issues related with the design studio activities.

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# Introducing building physics concepts in architectural education – Analysis of curriculum changes in recent years

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**ABSTRACT**
The planned curriculum changes and subsequent implementation of these changes can significantly affect the education of architecture students. Therefore, it is of utmost importance to analyse the benefits before the changes and review the outcomes afterwards.
Considering this, the paper approaches change analysis of the "Building Physics" at the Faculty of Architecture and Urban Planning. The course and practical activities used to be part of the curriculum of the fourth year, offering students, relatively late, all the essential knowledge regarding energy efficiency. Therefore, since the topic is significant in the current architectural context, it was thought to be suitable to move the subject to the second year, when students start to approach basic architectural design. However, the results obtained for both the theoretical and practical activities have shown that students do not have the necessary information to understand these concepts, and the subject was moved back to the fourth year.
Therefore, the paper comprehensively analyses the "Building Physics" academic outcomes at the Faculty of Architecture and Urban Planning. It analysed the reasons behind all the performed changes by comparing the results obtained by the students in the last six years for both fourth- and second-year students.

**Keywords:** Building Physics, Energy efficiency, Curriculum changes, Syllabus, Curriculum review

## 1 INTRODUCTION

The continuously changing global climatic conditions and constantly modifying energy efficiency and performance-related directives, standards and norms [1] make "building physics" related teaching subjects highly valuable today. It is a topic which can be assessed and taught by considering a wide variety of aspects, ranging from environmental-related factors to urban context, architectural aesthetics and detailing to building systems, while also focusing on the social effects [2]. By acknowledging the importance of considering all these factors, which ultimately can affect the comfort of inhabitants and urban areas, students can design a more sustainable architecture and through this respect the "2030 Agenda for Sustainable Development" and the "Sustainable Development Goals" [3]–[5].

Considering all this, at the Faculty of Architecture and Urban Planning, two subjects related to "building physics" are taught, one organised with two-course hours and one seminary class and the second as a three-hour/week project. In both classes, students learn the complexity of performing an energy performance analysis, first using simple equations according to national norms and second by using computer-aided design programs suitable for the automatic analysis of the energy efficiency of a building directly from the architectural model.

## 2 CONTEXT

Up until the academic year 2018-2019, the "Building Physics" course was taught to 4$^{th}$ year students considering that by that time, they would have acquired all necessary information to make informed decisions concerning the materials which should be used to obtain a better energy performance of a building.

The primary purpose of the new MC 001-2022: Methodology for calculating the energy performance of buildings [6] is to provide clear guidelines for the energy performance analysis of different types of buildings and to define a series of solutions which can be used to increase their energy efficiency. At the same time, it also expresses the minimal performance requirements of nearly zero energy buildings (NZEB) for both new and existing buildings that need refurbishment since all buildings starting with December 2020 should comply with these standards.

Based on this updated norm, it was considered of utmost importance to introduce energy performance-related principles early on in the education of architecture students; thus, a curriculum change was performed, and the subject was moved to the second year, taught only until the academic year 2021-2022. The decision to move the subject later in the educational process was taken based on discussions with other teachers and professionals and on the students' observed struggle to understand the principles without having yet acquired sufficient knowledge regarding building materials and finishes. Before making the change, the curriculum of the other architecture-related faculties and universities was also analysed to see when this subject is included in the teaching plan. The following was observed:

- "Ion Mincu" University of Architecture and Urban Planning – "Building physics" - 4$^{th}$ year, 1$^{st}$ semester – 2ECTS – 2 course hours, no practical activities included. The course focuses on the link between building physics-related factors and the building, including construction materials and aesthetics [7].
- Technical University of Cluj-Napoca, Faculty of Architecture and Urban Planning – "Building physics and urban environment" - 4$^{th}$ year, 2$^{nd}$ semester – 2ECTS – 2 course hours, no practical activities included. The course is focused on basic knowledge of building physics-related principles [8].
- University of Oradea, Faculty of Construction, Cadastre and Architecture - "Building physics and urban environment" - 4$^{th}$ year, 2$^{nd}$ semester – 2ECTS – 2 course hours, no practical activities included. The course focuses on detailing the building enclosure while

keeping in mind both the aesthetics of the building and its energy performance [9].

- "Gheorghe Asachi" Technical University of Iasi, Faculty of Architecture "G.M. Cantacuzino"- 4th year, 2nd semester – "Building physics" - 2ECTS – 2 course hours, 2 project hours. The course focuses on the detailing of the building enclosure while focusing on the energy performance of the building [10].

This analysis concluded that the subject should be moved back to the 4th year, similar to all the other faculties. But before this, a thorough analysis of the student's academic performance had to be performed.

## 3 "BUILDING PHYSICS" TEACHING ACTIVITIES DESCRIPTION

Compared to all the other Romanian architecture related "Building physics" classes at the Faculty of Architecture and Urban Planning of the Politehnica University of Timisoara, the class is organised considering 2 course and an additional 2 seminary hours. In this way, principles and theories taught during the course can be better understood during the practical activities.

For the practical activities performed during the whole period, students had to analyse the energy performance of a given residential building (Fig. 1). The case studies were one- or two-story houses, which also included terraces and heated or unheated attics. From the provided plan, sections and elevations of the buildings, the students could obtain all the data necessary for the energy performance analysis, including materials used for all the enclosure elements.

The whole exercise was performed using a comprehensive Xcel workbook, which was preformatted to guide the students during the analysis and provide them with the necessary information automatically (Fig. 2).

First, the students had to determine the thermal resistance of each part of the envelope and ensure that the obtained values were higher than the ones imposed in the national norms. To do this, first, they had to calculate the area of all exterior surfaces that could cause heat loss. Subsequently, they had to fill out a list of materials for each composing external structure, thus also focusing on the thermal conductivity of each material, which they had to identify by studying technical sheets of different producers. Through this, students were encouraged to explore the diversity of materials currently used.

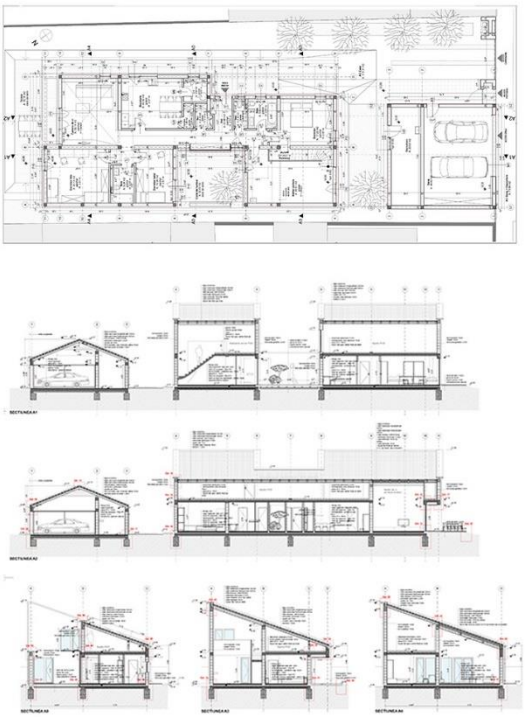

Fig. 1 Analysed buildings

| | |
|---|---|
| Denumire proiect | Casa unifamiliala |
| Amplasament (localitate) | *(se va scrie conform tabel)* |
| Nr. an studiu | 2 |
| Studenti | nume 1 + nume 2 |
| Faza | Seminar Fizica Constructiilor |
| **DATE DE INTRARE** | |
| 1. Aria placii pe sol tip 1 - $A_{11}$ (gresie) | 1'. Aria placii pe sol tip 2 - $A_{12}$ (parchet) |
| $A_{11}[m^2]$: 100 | $A'_{12}[m^2]$: 0 |
| 2. Aria placii peste subsol tip 1 $A_{21}$ | 2'. Aria placii peste subsol tip 2 - $A_{22}$ |
| $A'_{21}[m^2]$: *Nu exista (se inlocuieste cu 0)* | $A'_{22}[m^2]$: *Nu exista (se inlocuieste cu 0)* |
| 3. Aria placii sub pod/terasa/acoperis tip 1 - $A_{31}$ | 3'. Aria placii sub pod/terasa/acoperis tip 2 - $A_{32}$ |
| $A_{31}[m^2]$: 100 | $A'_{32}[m^2]$: 0 |
| 4. Aria tamplariei exterioare tip 1 - $A_{41}$ (ferestre, luminatoare) | 4'. Aria tamplariei exterioare tip 2 - $A_{42}$ (usi) |
| $A_{41}[m^2]$: 50 | $A'_{42}[m^2]$: 25 |
| 5. Aria peretilor exteriori tip 1 - $A_{51}$ | 5'. Aria peretilor exteriori tip 2 - $A_{52}$ |
| $A_{51}[m^2]$: 250 | $A_{52}[m^2]$: Nu exista (se inlocuieste cu 0) |
| 6. Aria intrados tip 1 - $A_6$ (gresie) | 7. Aria intrados tip 2 - $A_7$ (parchet) |
| $A_6[m^2]$: 75 | $A_7[m^2]$: 0 |
| 8. Aria anvelopei-A | Aria locuibila (camere de zi, dormitoare, etc...) |
| $A[m^2]$: 600 | $A[m^2]$: 0 |
| 9. Volumul cladirii-V | Aria incalzita (toate spatiile interioare - arie utila) |
| $V[m^3]$: 400.00 | $A[m^2]$: 0 |
| 10. Categoria cladirii | |
| cladiri individuale (case unifamiliale, cuplate sau insiruite) | |

Fig. 2 Energy performance evaluation form – areas of the exterior enclosure

In the second part of the seminary, students also had to fill out an energy performance certificate of the building by also considering its location and climatic conditions. The primary purpose of this certificate is to determine the energy performance and annual energy consumption for heating, domestic hot water, ventilation/air conditioning and lighting based on the occupants of the building (Fig. 3).

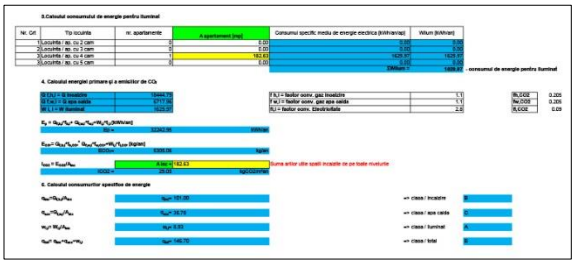

Fig. 3 Energy performance evaluation form - energy performance classes

The exam was organised during the analysed period as a multiple-answer type of quiz, approaching all the major taught subjects in the previous 14 courses.

## 4 RESULT ANALYSIS

To better understand the impact of the performed curriculum changes, the academic results of both 2nd and 4th-year students were analysed and compared by looking at the outcomes of the practical activities and the final examination for the transition period, when both years were taking the class at the same time (2018-2019 and 2019-2020).

Subsequently, the periods before, during and after the transition were compared to better see if there were specific changes in the distribution of the obtained grades.

### 4.1 COMPARISON BETWEEN SECOND- AND FOURTH-YEAR STUDENTS

#### 4.1.1 Academic year 2018-2019

As a start, the first transition year was analysed. When looking back at the feedback given to the students after the seminary, it was observed that more observations were given to second-year students than to the fourth-year ones, who understood the assignment better and could determine the energy performance of the buildings.

When analysing the grade distribution of that year, it was observed that for the practical activities, about a third (33%) of the second-year students obtained grades below 7 while only 8% of the fourth-year students were in the same situation. The reverse can be observed for higher grades, where 72% of the students in the fourth year obtained a grade over 8 compared to 48% of the second-year students. The percentages of students for 7 up to 8 grades are quite similar (Fig. 4). On average, fourth-year students had one point more than second-year ones, 8.2 compared to 7.3.

When looking at the final exam quiz, the results are almost equal, with only minor differences between the two years (Fig. 5). The obtained average grade is about 7 in both cases.

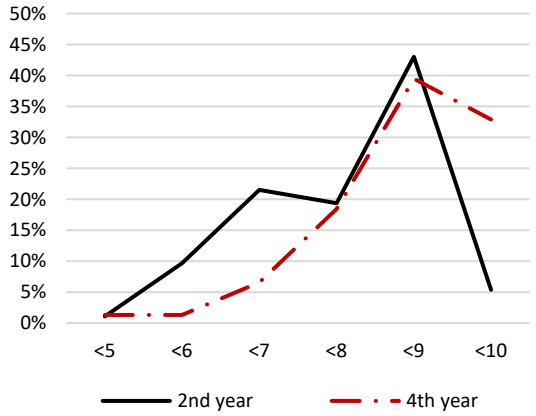


Fig. 4 2018-2019 - Seminary grades distribution

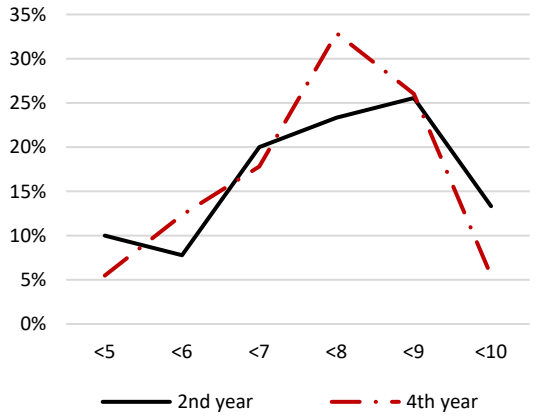


Fig. 5 2018-2019 - Exam grades distribution

### 4.1.2 Academic year 2019-2020

Subsequently, the 2019-2020 academic year was also analysed, showing even more considerable differences between the two years, mainly in the 7 up to 10-grade area.

When analysing the practical activities outcomes, it was observed that 6% of second year students were unable to promote the practical part of the course because they were unable to finish the exercise. No such case was identified among the fourth-year students. Obtained results in the 5 to 7 grade areas are similar, with about 11% of the students. The main differences were observed for 8 to 9 grades, obtained by 44% of second-year students compared to 26% of the fourth year, while grades over 9 were obtained by a majority of fourth-year students (36%) compared to 6% (Fig. 6).

The differences are even higher when analysing the exam results since most fourth-grade students had grades over 7 (95%), while about 30% of second-year students had grades of 6 and below. 23% of second-year students did not pass the exam during the first presentation (Fig. 7)

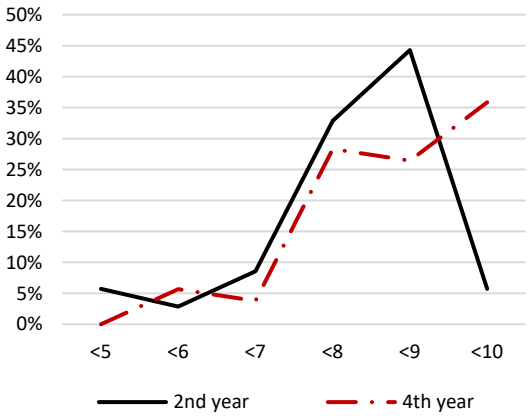


Fig. 6 2019-2020 - Seminary grades distribution

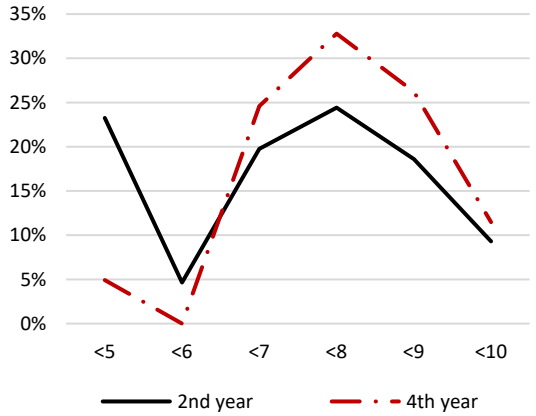


Fig. 7 2019-2020 - Exam grades distribution

On average, fourth-year students had one point more than second-year students for practical activities and exams.

### 4.2 GENERAL COMPARISON

Ultimately, the results two years before and after the curriculum changes were also introduced into the analysis to see if a particular trend could be observed and if the change impacted the general understanding of the studied topic.

As in the previous analysis, first, the practical activity grades were analysed (Fig. 8). No significant changes in the grade distribution was observed, with a majority of 7 to 9 grades for all the analysed period, except for the 2016-2017 academic year, when the distribution of the grades was almost equal, between 15-25% of the students for each grade. It was also observed that up to 8% of second-year students are failing the practical activities compared to a maximum of 3% in the case of fourth-year students. When looking at average grades, it was observed that they are continuously getting higher, from 7.8 in the 2016-2017 academic year to 8.5 in 2021-2022, with the apparent differences between the second and fourth years observed in the transition years.

On the other hand, evident changes and decreases in the academic performance of the students can be observed when analysing the results obtained after the first presentation of the final exam (Fig. 9). The study brings forward that about 50 to 60% second-year students have failed their exam in 2020-2021 and 2021-2022,

which represent a significant increase compared to the 20% who failed in all the previous analysed years. The higher grades also continuously decreased until the end of the analysed period, with no grades above 9 in the last two academic years.

The same was also observed when analysing the mean exam grades during the whole considered period, which shows a slight 6% increase during the transition period compared to the first studied year (from 6.7 to 7.11) and a 22% decrease in the last two years (from 6.7 to 5.18).

CONCLUSIONS

The study approaches the analysis of the curriculum changes performed for the "Building Physics" course and their effect on the academic performance of 2nd and 4th year students affected by the changes. To understand the effects, the academic results of the students were analysed for a period from two years before until two years after the transition (2016-2022)

The study shows, by comparing the grades obtained by the students for both practical activities and final exam, that the decision to move the course early on in the education of architecture students was not beneficial for their

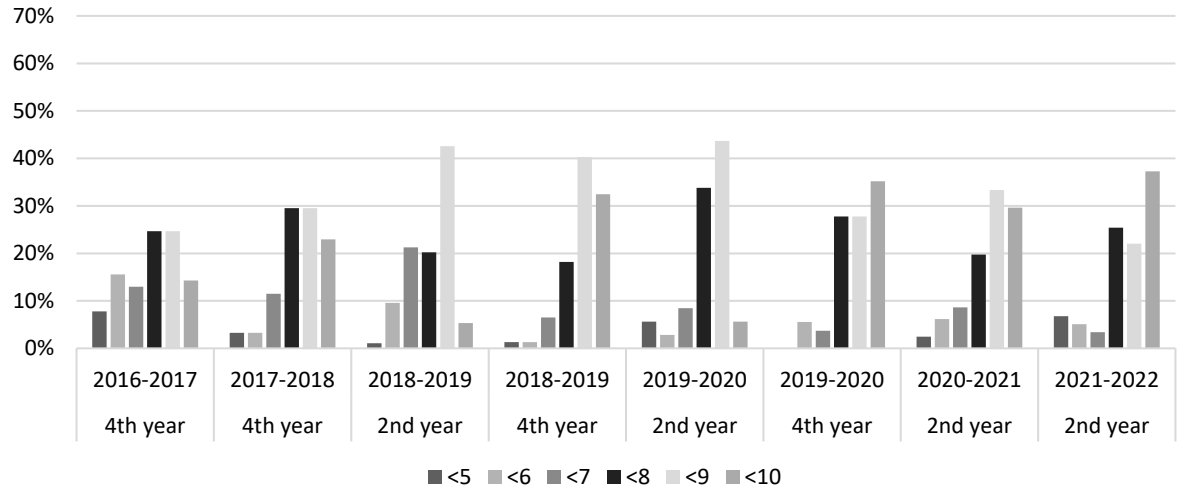


Fig. 8 Seminary grades distribution

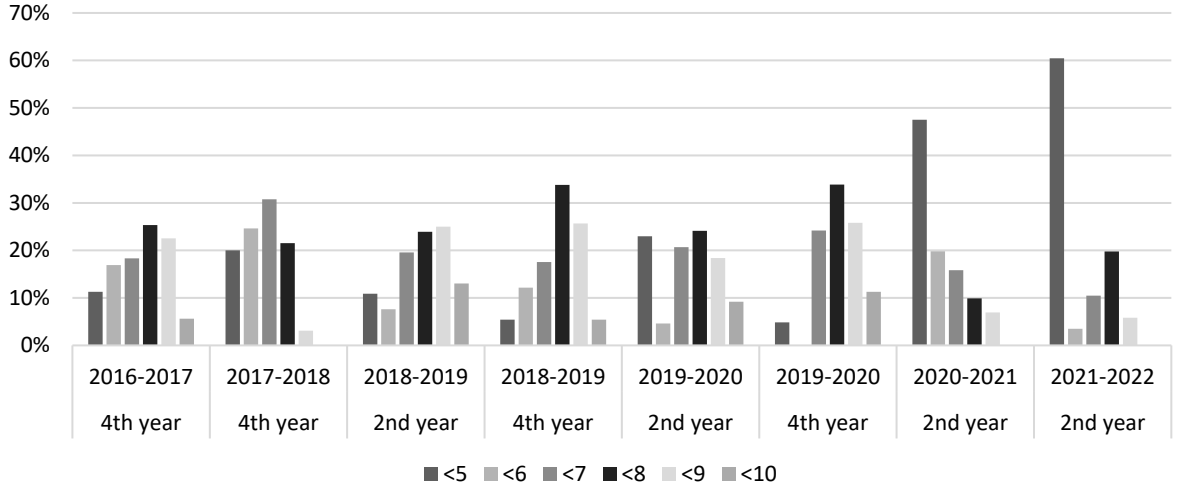


Fig. 9 Exam grades distribution

development. It proves that their lack of comprehensive knowledge regarding building materials and construction technologies impacts their understanding of energy performance-related principles. Despite not clearly understanding the theoretical concepts of the subject, they were able to perform during the practical activities, showing that they can apply taught principles without actually understanding the topic as a whole.

At the same time, since the taught principles are not approached during the "Architectural design" classes, students tend to forget all the "Building physics" related information. Main energy performance parameters had to be approached again later during the "Architectural design" classes in the fourth year.

On the other hand, fourth-year students performed slightly worse during the practical activities, caused mainly by the lack of time to focus on the subject. Their performance during the exam also shows that they understand how to link the energy performance principles to other information acquired in previous years.

Considering all these, in 2022, the decision was taken to move the "Building Physics" course back from the second year to the fourth year and, through this, ensure that the students are ready to understand a significant topic in current design practice.

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# For a Civilized Architecture
# Learning together with the students at Ion Mincu University

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**ABSTRACT**
The modernist canon is dead, like the classical one before it. That does not mean that traditional, historical or modernist architectures are to be discarded. However, what has disappeared is the certainty of a clear, precise and consensual system. Therefore, any professor/studio/department/architecture school has to define their own pedagogical project – most likely somewhat derivative and probably subjective, but hopefully thoughtful, grounded and substantiated: aimed towards a civilized architecture. This paper will try to highlight the teaching strategy developed for the last 10 years at a design atelier within the 1st, 2nd and 3rd year Department at the "Ion Mincu" University of Architecture and Urbanism of Bucharest.
Our method is shaped by four essential categories and principles:
- some clear fundaments of our profession, that go beyond style and era, such as space, light, construction and technology, sheltering, honesty;
- time and place: context is considered not solely as a location or a morphological system, but as a superposition of traces, orders, actors, in which the present architectural project becomes a new – and open – layer;
- empathy and solidarity: we try to look at people's relation to architecture, at interests, negotiations, evolutions and potential scenarios;
- common learning, shared by the student and the tutors: a model that favors independence, collaboration and interrogation.

The paper will develop this principles and directions and present selections of both finished projects and pedagogical exercises that accompany the project. We will talk about "puppet houses", "my project after 20 years" and a lot of other things. These are implemented in the atelier as ways of better involving the students and immersing them in the design process.

**Keywords:** empathy, articulation, responsibility, typology, layers

## 1 INTRODUCTION

Even in times of intense change, such as the ones we are currently experiencing, architecture has an advantage over other artistic disciplines. As it is connected to functions and needs, it preserves a hard core, which scientific and social developments have not yet threatened. A house, for instance, should provide shelter and it should be standing firmly, it should also be able to be well lived in. Architecture continues to be about space and ethics. These fundamental and timeless qualities, as well as more timely topics – the climate crisis, the burst of building and design technologies, overcrowding and the right to decent living, pluralism, the democratic and inclusive city – are professional principles, to be found in the curriculum of any school of architecture.[1]

Pedagogical projects differ in how they prioritize these elements, but especially in their way of answering to the collapse of the professional canon (not the canon as a corpus of work and model principles, but in the sense of a set of *prescriptions* of how to achieve the good and the beautiful).

The Modernist canon, which had replaced the classical one, has been dead for some decades itself. A new one is not in sight, which makes it difficult to teach design on solid, clear, and consensual grounds. Neither are we in a world of total randomness; stable things and references still remain. But the "good" is now plural and complex, we are no longer given any firm guarantees. This forces us to consider the trade and what we teach, to define grounds, hierarchies, limits, ourselves.

As a school/department/design atelier/teacher, one must define one's own pedagogical project, that is a vision which will be, unavoidably, neither unique, nor completely objective, but hopefully a thoughtful, grounded and substantiated way of teaching.

Next, we will be talking about the pedagogical project for the architecture atelier we have built over the past 15 years within the "Ion Mincu" University of Architecture and Urbanism of Bucharest. The atelier is founded on four essential principles/categories:

## 2 Firm support and overcoming solving for correctness

We strongly rely on the hard core elements we mentioned before, that we see as fundamentals of the profession. However, we insist that they should not be treated as elements of a mathematical problem, objective requirements to be "solved" by students, but that they should become *project determinants*. Students are invited to overcome the stage of correct, limited, and disparate answers, to inquire the various categories and their interdependencies, to regard them as a whole and in a wider context. Thus, such elements are not just necessary for the project, but they start producing the project and adding architectural value.

Structure not only solves architecture, it becomes part of it, so do light, materials, the relationship between served and servant spaces, functional and technical solutions.

The word which determines our profession in relationship with design, for instance, is space. However, for architects (and urbanists, to some degree), architectural space is not just a general environment that contains objects, but an object in itself. A concrete object, defined through its shape, its degree of openness and the reciprocal relationships between limits, in various relationships with other spaces and with the general one. We insist on the pre-eminence of space – urban, public, private, exterior, interior – over the autonomous object and the spectacular form.

[1] For an official and consensual synthesis, it is worth taking a look at the UNESCO-UIA VALIDATION COUNCIL FOR ARCHITECTURAL EDUCATION, "UNESCO-UIA CHARTER FOR ARCHITECTURAL EDUCATION, Revised" [1]. 21 objectives are listed at pages 6-8, from the balance of "emotion, reason and intuition", to receiving certification after at least five years of learning and two years of practice. The Charter's conclusion states that: "Beyond all aesthetic, technical and financial aspects of the professional responsibilities, the major concerns, expressed by the Charter, are the social commitment of the profession, i.e. the awareness of the role and responsibility of the architect in his or her respective society, as well as the improvement of the quality of life through sustainable human settlements.", p. 10

## 3 PLACE AND TIME. HISTORY, MODELS, SUSTAINABILITY

We are firm believers, and we try to pass this on to our students, in a critical modernity, in synchronization and the contemporary spirit. At the same time, we attempt to make them enquire, and not just copy images, to take a critical stance towards trending models.

One of the ways to accomplish this is to integrate the contemporary discourse with a look at the past and, very important, to do that from the point of view of the design practice. *Continuity* is a key concept in this respect. We believe that it is essential that students understand both historical modernism and contemporary production as moments of a historical process. If we look at architecture as a process *of building further, the history of the subject becomes a direct source for a present practice.* Not by subserviently copying styles or forms which no longer make sense today, but by understanding governing laws and devices, how basic components of the profession were introduced throughout many places and times. Once these models are read together and in comparison with modern ones, we have witnessed the birth of a very fertile reciprocal integration. This greatly helps in resisting both contemporary formalism and nostalgia, traditionalism or even anti-modernity.

An instrument in this respect is the reinterpretation of *the architectural and urban type*. Its use as an instrument for analysis and design allows for a recourse to history, free of style and focused on essential architectural and urban elements. It really works when not used in a traditional-conservative manner, but for modern situations and programs.

For the site analysis, we ask the students to research not only the current situation, but also the *process of the historical development of a place*, as well as distinguishable tendencies. They are thus stimulated not only to better understand a part of the city, but also to see their design as part of a history, a layer in a succession of changes that do not end with the project.

Working with(in) time also means acknowledging *the vital importance of recovering and rehabilitating existing buildings, even if they are not listed heritage.* Architecture schools are still almost exclusively focused on the new and completed building whereas our entire built or territorial heritage – even a huge part of what we call "nature" – is the result of additions and transformations of what was new at some point. \Besides, it has become clear that the greenest building is an existing one, which is not demolished, but rehabilitated.[2] Our studio (and common cross-studio) projects, as well as the graduation projects, almost always introduce this topic. A sense of responsibility and cultural identity starts to emerge in the atelier; our experience also shows that, far from diminishing students' creativity, building further, with all its constraints, stimulates it.

Rehabilitation and time, the project as a layer among others, naturally bring into discussion the future: paraphrasing the above, the most sustainable new building is one which will stand in time, be able to adapt, and, even more, will possess the very qualities to make it worth preserving and change, without losing its character. The project is presented in terms of scenarios and of an open design.

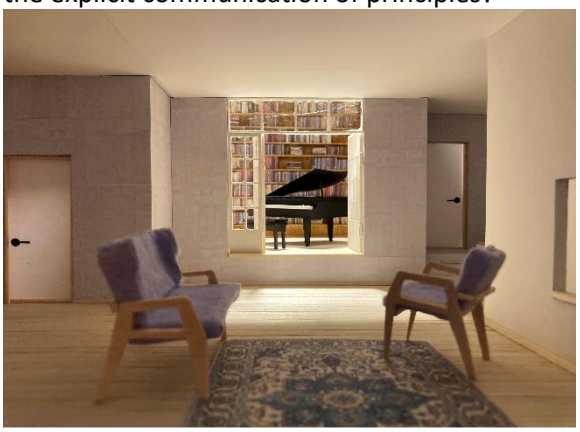
## 4 PUBLIC, PRIVATE, SOCIETY, EMPATHY

Modernism's failures have shown us the danger of architects wanting to save the world, to change society through generic and abstract approaches. That being said, our work cannot just be about assuming the correct and aesthetical solution, but also about not spoiling, and, if possible, improving the state of people and places. Responsibility towards the client is the profession's code of ethics. But, considering the huge issues of territorial development – not just the climate crisis, but also the depletion of land resources, the collapse of ecosystems, the development disparities, we can consider that, responsibility-wise, today's client somehow becomes the entire society and added value becomes an architectural duty.

We must also take this step in order to survive as a profession. Today, important parts of our basic activity are taken over by others, we tend to be

[2] In Germany, in 2023, the share of rehabilitations out of the total building industry far exceeded that of new buildings [2].

reduced to delivering preliminary projects, agreeable images. It is therefore vital to regain focus on our overall mission, on our synthetic thinking and on our capacity of coordination and mediation. At the same time, we need to learn to understand the various actors involved and to become partners of the communities that are claiming their right to a good living.
What does this mean for design teaching, beyond the explicit communication of principles?



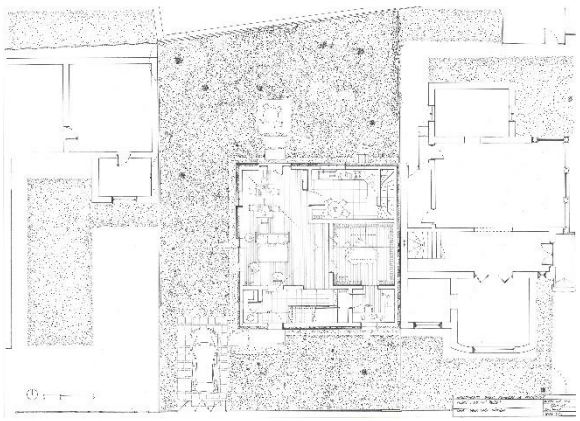


Fig. 1 THE DOLL HOUSE

Mădădlina Dobre, 2nd year project: a single-family, semi-detached house in a 1920s garden city development.

(Fig.1) The volume is compact and restrained – a well-behaved guest in a structured place. The complexity is concentrated inside, where rooms of different heights and elevations open towards the garden or the „secret" room towards the blind wall, a three storey-high place for music and books, open towards the sky.

Ground floor plan and photo of the partial 1:20 physical model. A similar physical model of a room in a historic or modern dwelling of reference was realized during the analysis stage.

"The Doll House" is inspired by similar exercises at the ETH in Zürich.

First, we are attempting, since the very first exercises, to compensate for the unavoidable abstraction of the human element. Student projects are essentially exercises without immediate applicability: the topics start from actual programs and needs, but the "clients" are not real ones. In order to bring students closer to real people, with whom they will be dealing as architects, we use, for instance, the site analysis stage.

Fig. 2 TWENTY YEARS AFTER

Diana Bucur, Camelia Stanciu, an exercise within the final 2nd year project – a 7-unit multifamily dwelling in Bucharest.

(Fig.2) Towards the end of the 3rd project in the 2nd year, we ask the students to draw-up a scenario of how the multifamily dwelling will evolve long after the architect has left. Here, the private space open to the public may be closed, inhabitants will change and add elements, in a quite typical way for Bucharest. The aims of the self-critical exercise are, firstly, to pass from mapping the way people act to understanding why they react in a certain way, so as to better empathize with hidden needs and problems; secondly, the students can verify the architectural strength of their own designs, understanding how their projects might withstand heavy change.

We invite the students not to limit themselves to the study of urban and architectural forms, but to "read" the life of the place: dwelling practices, how inhabitants are transforming their houses over time, how public space is used, as well as how all

of these have evolved over time. Here appears a small transdisciplinary incursion – towards anthropology, first and foremost: students are invited to also talk to the local people and to write down and present these discussions. But the study is primarily achieved using the means of the profession – by drawing on site, then mapping these data on plans and other media. We have noticed that this connection will make the students even more involved, more sensible to the inhabitants' issues and aspirations. It also helps them to understand the relationships, the subtle differences and interferences between the private and the public domain, within the family etc. They start to better understand values (human scale, familiarity, the need for personal improvement), even when they occur in more modest, apparently commonplace contexts, devoid of highbrow aesthetic or historical value.
Two very visible effects appear in the finished projects. First of all, the students make efforts to achieve that "added value" we were speaking of earlier: additional functions that should serve the city, making portions of the private space accessible etc. Secondly, this responsibility helps the final project to not remain a static solution, but, as we were saying earlier, an open scenario.

## 5 THE METHOD: THE MASTER AND THE MIDWIFE, THE CRITICAL CYCLE

Finally, we should discuss the relationship between student and teacher and empowering the former. Learning architecture as an apprentice has defined nearly all of the profession's history. While the canon crisis has endangered the absolute dominance of this pedagogical method, not even the most radical and anti-authoritarian method can completely oust the master. Among the trade's still-valid essential elements there is also the part of craft, of art (also in the old sense of the word), which entails the transmission of knowledge and the training of abilities by professionals with concrete, quality experience. But the uncertainty we were discussing earlier brought the need for a critical overlook of one's practice and teaching and the need for building one's own program becomes essential, as does the need to bring something extra to the old paradigm.

Fig. 3 Sorin Olteanu, Ștefan Olteanu, Diana Bucur, Andrei Ivanovits, Ionuț Ursachi: the transformation of the derelict Liberty Center Mall in Bucharest into a mixed-use neighborhood, 1st project, 3rd year.

(Fig.3) A typological approach of the radical functional and social reinvention of an existing structure. The case studies which were researched were the amphitheater in Arles and the Palace of Diocletian in Split, both examples of buildings turned into cities. The mall morphs into a real neighborhood, part of the general urban fabric, with streets, blocks, squares, green areas, dwellings, workplaces, public and commercial amenities. The structural grid and some recognizable parts of the old building are kept.

Fig.4 Laura Strat, Daria Mogîldea, final 3rd year project: collective dwelling in Bucharest.

(Fig.4) The project creates a secondary urban fabric within the existing one of the city: a street, *plazas*, *cul-de-sacs* (all typical of Bucharest), front- and backyards, staircases designed as meeting places, a restrained expression, contemporary details.

We consider ourselves close to the *"midwife" model,* also approached by a great professor, Elia Zenghelis, former partner within the famous OMA (Office for Metropolitan Architecture) office and professor of Rem Koolhaas and Zaha Hadid. [3-4].
In this sense, the project (the "child") is truly the student's; you may only help its birth. Instead of the prescriptive model we are talking about the tutor providing a good framework, one of attendance, even of learning together and from each other. We see our task in organizing the route and in supporting the student's own search.
Tutoring assumedly puts emphasis on coherence and adequacy, rather than on the fully bound object. It promotes interrogation, fertile discussion, both for the student, and for the teacher. Well handled, it can compensate not only for the canon's fixed rules and discourage imitation, but can also overcome the current obsession with the spectacular and formal originality.

Within the teaching process, the analysis of a place and of models, which we were discussing earlier, is followed by building one's own endeavor – a positioning towards the place, a schematic architectural solution. Throughout the project, this endeavor progresses and is enriched. The dialogue with the tutor leads to a better solving of technical aspects and of the spatial structure, to clarifications and improvements, but also serves to preserving and refining initial principles. Coherence, pertinence and consistency become criteria in the ongoing and final assessment of projects. The consideration of a place's layers, that we were discussing earlier, applies not only to the solution, but also to the project's route itself, seen as an ongoing process.
A current issue in any school of architecture is the lack of continuity between analysis and project. Once deeply immersed in developing the proposal, in functional and technical solutions and issues, students tend to forget what they have learned. Part of what we would call a "critical progress" method is that essential pieces required in the analysis (for instance morphological plans, model studies etc.) should be resumed, but by integrating the solution in the respective stage: an adjustment and a permanent reference to the project's origins

and primary ideas. Next, we will see how the above principles are found, in an integrated manner, in a few examples of projects over the past years.

## 6 CONCLUSION

Conclusions are difficult since the process is intentionally open-ended, as is the method. This ensures that we, as tutors, avoid being locked in recipes, constantly adapting and in ideological crisis. In a similar way, the same happens to our students, who (hopefully) learn to use their environment and reinvent themselves for each project. It is a process of *learning to learn*, to craft one's own tools and own ideas in a very site-specific manner.

This open-ended method ensures that conclusions/recipes are avoided; no definitive answer is the best, nor is it universal.

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# Reactions on the New European Bauhaus Design Curricula: Project Oriented Approach at the Master Course Sustainable City (University of Belgrade - Faculty of Architecture)

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**ABSTRACT**
Design education in architecture and its allied disciplines represents one of the cornerstones for design professionals, contributing to the sustainable future of the built environment. However, despite the dedication of educators, the changing focus in design pedagogy is still not fully embraced in the university setting. Recent concerns about outmoded and static approaches in the higher education have, therefore, triggered some new insights casing the updating, upgrading and improvement of programs. Consequently, critical thinking and inquiry, creativity and innovation, research and investigation, collaboration and civic engagement, supported by technical competences, have become increasingly valued in the contemporary design pedagogy.
Following this trend, one of the master courses at the University of Belgrade - Faculty of Architecture, entitled Sustainable City, has been structured around the project oriented approach. The curriculum supports student` work, with the final test in the form of a Civil Initiative Project Proposal which responds to various ongoing competitions and calls. The process is finalised through a Civil Initiative Project Proposal data set, established on the Teams platform, providing the possibility of an active involvement into practice, while solving the various problems of local communities.

**Keywords:** design education, architecture, practice, active involvement, local communities, civil initiative project proposal

## 1 INTRODUCTION: THE ROLE OF ARCHITECTURAL EDUCATION IN SUPPORTING THE CONTEMPORARY SOCIETY

After the recent concerns about the inflexibility of outdated pedagogical approaches in the higher education, the university curricula related to the design courses have been gradually adjusted to the contemporary paradigms of general sustainability and resilience. Due to their significant role in shaping and developing the future of the built environment of global settlements, the architectural and urban design have also adjusted their methodologies to the increased dynamic of changes and multiple challenges. Based on the desired qualities of critical thinking and inquiry, creativity and innovation, research and investigation, collaboration and civic engagement, many courses have also taken into consideration a variety of approaches and different contextual factors. However, the high level of diversity and a lack of common understanding have resulted in a heated debate among educators and academics regarding two major elements - the type of changes in the design pedagogy which would respond to the needs of the contemporary design profession and provide the best results, and their actual (and adequate) effects on the aspirations of the contemporary society and its transformations. These discussions resulted in a comprehensive report published by the MIT School of Architecture and Planning (Beinart, 1981). However, this was not an isolated effort and many other studies have followed, contributing significantly to the establishment of a new discourse on the design pedagogy, while also representing a prelude and an encouragement for a debate on the current architectural education and practice.

For example, the book Voices in Architectural Education: Cultural Politics and Pedagogy (Dutton, et. al. eds. 1991) challenges architectural educators to intensify interaction with students in the political, social, and cultural terms. It establishes links between architectural education and society and presents a conceptualisation of architectural pedagogy within a critical analysis of the larger society. The work of Teymur (1992) - Architectural Education: Issues in Educational Policies and Practice - contextualises the debate on architectural education and discusses the role and impact of various theories in design teaching. He also supports the notion of education for international practice and global exchange.

The local context was considered in the book Architecture: Art or Profession? Three Hundred Years of Architectural Education in Britain (Crinson and Lubbock, 1994) which provided the first general history of architectural education, while discussing the relation between an architect's education and the overall built environment, as well as the lessons of the past. Salama (1995) provided an insight into the new trends in architectural education, highlighting the role of the design studio and considering various innovative concepts within this teaching model.

The more recent discourse on design pedagogy also emphasises the importance of civil initiatives including the best practices into teaching and learning. Major contributions to this more pragmatic trend include the initial ideas of Boyer and Mitgang (1996), arguing for a more liberal, flexible, and integrated curriculum connected to actual problems, as well as the edited volume of Pilling and Nicol (2000) dealing with the relation between architectural education and contemporary professional challenges. Salama (2009) also delivers an updated perspective on architectural and urban pedagogy, while Harriss and Widder (2014) underline the importance of the successful, evidence-based live projects in the architectural curricula.

## 2 TOWARDS MORE SUSTAINABLE URBAN COMMUNITIES: NEW EUROPEAN BAUHAUS AGENDA

The appearance of a New Design Pedagogy in the late 1990s, emphasised the context of more sustainable urban communities. This approach also caused the re-thinking of traditional methods, design tools, techniques, models and characteristics. Consequently, the design

process generated new methodologies - case study model, community-based design learning model and participative curriculum model. Additionally, critical inquiry and the Process-Oriented Design Pedagogy (from the late 1990s to the mid 2010s) were linked to creative thinking and successful intelligence in architecture and design (Salama, 2016). Finally, the problems in urban communities caused some new focuses in the 2020s: Interchangeable design pedagogies, Community based design pedagogy and live project studios, which are a recently promoted concept of the New European Bauhaus Paper (NEB, 2021).

New directions for pedagogy in architecture forced design educators and the schools of architecture to meet the challenges posed by new educational trends, re-emerging learning philosophies and the new digital technology. Current digital tools can facilitate the assessment of performative criteria, such as daylight, shading, noise, air and water qualities, biodiversity health, comfort, user appreciation, energy, water, waste and related services (e.g. shared mobility), all essential to maximising the opportunities for passive design techniques. However, digital tools are not used coherently, systemically and at the wider scale, addressing all the aspects from the New European Bauhaus agenda and the Green Deal goals (NEB, 2021).

## 3 PROJECT ORIENTED APPROACH: THE CASE OF THE COURSE SUSTAINABLE CITY

The project oriented approach implemented during the course Sustainable City, creates a curriculum which supports active student` participation in the real problems of local communities. Located at the 1st year of master studies, both as an obligatory and elective course (depending on the selected master program) represents a research polygon for curriculum design and further upgrading. Following the ideas of Chen and Hoffman (2017), who successfully applied experimental and innovative game-based curriculum design to the studies of urban surrounding, as well as the work of Kelly (2006, 2010) focused reflexive thinking and journaling in education, the curriculum of Sustainable City tends to apply predictive learning and future design. These educational interventions are used to study the potential impact of changes on environmental values. Through the examples selected by students, a number of specific urban problems related to different aspects of sustainability are identified and described. The final test is conceived in the form of a Civil Initiative Project Proposal tackling the problems from the different ongoing competitions and project calls. The study process ends with the Civil Initiative Project Proposal data set, established on the Teams platform. Its role is to provide the possibility of an active involvement in the current practice and to address (and solve) various problems of urban communities.

By implementing this approach, the course enables students to determine and define their desired futures for the selected urban environments. These possible development options and opportunities are based on the synergy of foresight techniques and the long-term socio-cultural potentials of urban communities. Accordingly, this path leads to a designed academic intervention and the assessment of the possible results of environmentally shaped and future-oriented thinking, overcoming a gap between different environmental attitudes and ecological behaviours (Stupar, Mihajlov & Simic, 2017).

### *3.1*The *Phases of Learning*

By introducing the students' participation, the curriculum directly supports their research divided into two main phases: reflexive and creative, which are introduced during 14 weeks of the course and practiced through four steps-phases. The process of education implemented during the course could be explained by Kolb's learning cycle (Kolb, 1984). (Figure 1).:

- The first one consists of thematic discussions on the rising issues of urban ecology, urban population, available and-or limited resources, energy, air, water and waste systems, transportation, vegetation, local surrounding, etc. (time horizon 2030). This phase aims at

increasing a students` environmental consciousness.

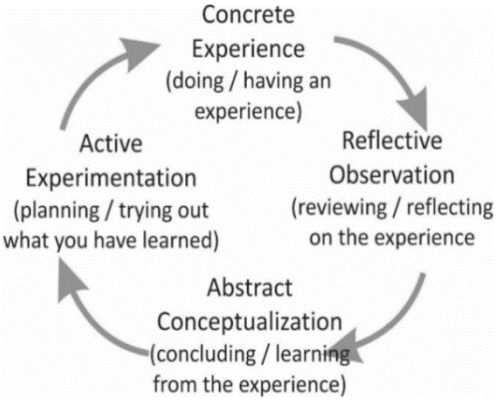


Figure 1. Kolb's learning cycle in the context of reflexive thinking (1984), adapted in the context of the Sustainable City course

- The second phase is related to the reflexive thinking. Students write down their impressions, addressing numerous questions related to: a) problems which might trigger their reaction/intellectual response; b) images/discussions which challenge their viewpoints/perspectives; c) methods for improving the sustainability of cities; d) their willingness to study the local environment in situ.
- The part related to the case study focuses on an urban transformation processes. Through the examples selected by students, a number of specific urban problems related to different aspects of sustainability are identified and described, as a practical contribution.
- The creative phase (exam) is the last step in the process. It includes the students 'proposals and recommendations for improving the selected urban environment, tested through a development of a small pilot project. These projects could tackle different problems and propose solutions in various forms and modes - from public innovations, tactical urbanism, urban revitalisation, adaptation to climate change, business-driven sustainable solutions, etc. Through this phase students verify their ability for preparing proposals for research grants, aiming at the desirable urban transformations via affordable solutions and a precise ecological purpose (e.g. tree planting, useful resource recycling, waste discount and reuse, urban green infrastructure preservation, defensive mangrove forest, experiencing vegetarianism, business start up programs etc.)

## 4 THE RESULTS: ENVIRONMENTAL ATTITUDES, CURRICULUM EXPERIENCES

The results of students` surveys are presented in the form of a Civic Initiative Project Proposal, applicable for different funding sources (e.g. civil society organisations, local initiatives, individuals and other interested parties). (Figure 2).

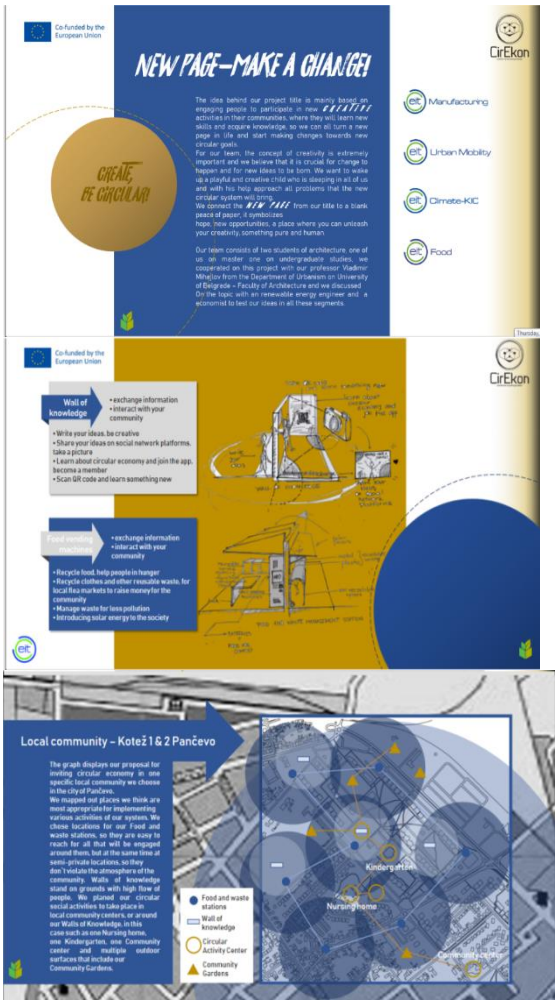


Figure 2. The proposal for improving the sustainability of the urban environment in Pancevo, tested by developing a small pilot project: students Emilija Drndarski and Sara Brkic (1st award at the CirEkon and EIT Food Competition for Engaging Citizens in Circular Economy)

## 5 CONCLUSION

The curriculum design, aimed at discovering the feasible and sustainable alterations of attitudes and roles via pedagogical stimulus, generated four principal questions for the involved lecturers:

1. What are the preferred attitudes of students regarding the surrounding and sustainable futures?
2. Do their attitudes alternate drastically when exposed to a pedagogical stimulus related to a sustainable foresight?
3. What are the images and eventualities of their desired/anticipated environments?
4. Do the interventions from pilot projects have an impact on their own environmental awareness and future actions?

The analysis of the curriculum and its results revealed that students` environmental awareness and the ability to envision the sustainable futures was increased after attending the course. Furthermore, the course layout additionally sought to probe students` attitudes in their favoured/anticipated environments in a qualitative mode, exploring the increase of their awareness, as well as the responsibilities and effects they could have on the environment. The improvement of their general attitude was influenced by the introduction of reflexive thinking and workshop discussions. (Figure 3.)

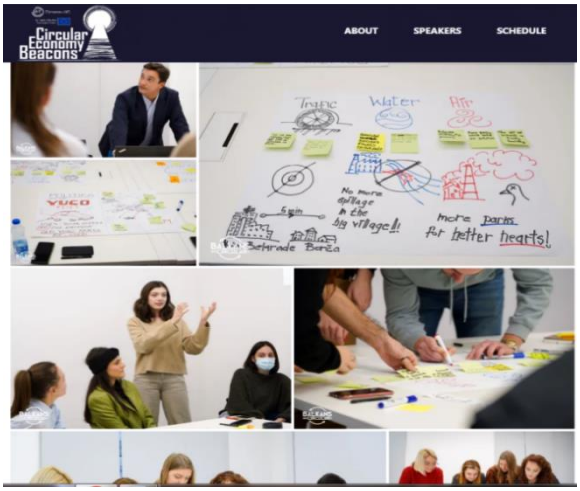


Figure 3. The workshop Balkans Go Circular: The database support to the Civil Initiative Project Proposals. Organized by EIT Climate KIC and CirEkon d.o.o. on December 15th, 2022, at the Serbian Chamber of Commerce, The participants were students from the course Sustainable City

https://circular-beacons.net/wrapping-up-the-year-with-balkans-go-circular-conference/

Consequently, the participating students summarised their perception of the course through 4 dimensions:

1. **Curriculum experience,** as a catalyst for expanding the research beyond the limitations of a classroom, enabling the closer insight into the real urban and natural features of a city;
2. **Linking motivation with reflexive thinking** in order to interconnect technological, cultural, spiritual, ecological aspects of environment, as well as to increase environmental consciousness;
3. **Ability to act in a social responsible manner** - which implies that in the anticipated ecological future change is possible. Upgrading the curriculum by stimulating the participation of students represents a strong and positive momentum for a radical change, supporting the hypothesis which claims that the ability to act can be enhanced through future-oriented educational interventions.
4. **Visions of a future urban society** - students are constantly encouraged to question their empirical views and the nature of cities, as well

as the dominant paradigms, looking at the connections between the outside and the inside world.

Considering this feedback, the course continues to develop and its data base could receive more public attention opening new possibilities for an interchange of theory, practice and education, as well as for some new initiatives to be explored, tested and verified - both at the University and among local communities. (Figure 4.)

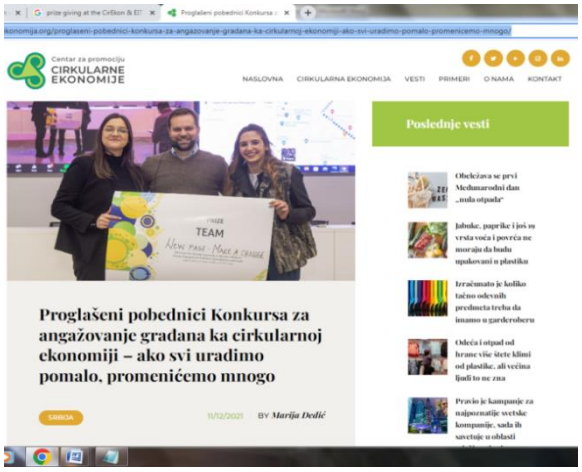


Figure 4. The awards ceremony at the CirEkon & EIT Food Competition "Engagement of students towards circular economy" on December 10th, 2021. Winners Emilija Dndarski and Sara Brkic (supervisor Associate Professor Dr. Vladimir Mihajlov), project entitled New Page - Make a Change. https://cirkularnaekonomija.org/proglaseni-pobednici-konkursa-za-angazovanje-gradana-ka-cirkularnoj-ekonomiji-ako-svi-uradimo-pomalo-promenicemo-mnogo/

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