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HERITAGE CONSERVATION THROUGH LEARNING. CASE-STUDY OF AN INTERNATIONAL MULTIDISCIPLINARY SUMMER SCHOOL

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Abstract

Education in the field of architecture represents an important but difficult task for the way in which we perceive the cities and the buildings in which we live. As a vocational profession, architecture must be taught and learnt through various applied methods, such as the case study method, which allow the students to deeply understand and properly apply the theoretical investigation procedures. This paper presents the results obtained after a multidisciplinary summer school, which was organised in Timișoara, the European Capital of Culture 2023, for a period of two weeks. The students involved were mainly architecture students from the Faculty of Architecture and Town Planning of Timișoara, but also there were several German students from sociology, anthropology, and town planning. The participation of the German students was possible due to a partnership with the German Academic Exchange Service D.A.A.D., based on a scholarship within the framework of the Go East Summer School program. The activities were based on a multidisciplinary investigation of a case study area, consisting of a group of historical buildings, in Timișoara. The students were organised in teams, and they did a detailed architectural-artistic, urbanistic, and socio-economic analysis of the area, which allowed them to determine the multicriterial vulnerability of the investigated buildings. The vulnerability assessment was based on a procedure that was previously developed and published by the same author. Moreover, complete surveys and 3D models, both digital and physical, were obtained. The results indicate a medium vulnerability of the case-study historical buildings, but the general conclusions of the study were that the area is very valuable from an architectural-cultural point of view. The students were able to investigate the history of the buildings, the nowadays functions, and the conservation state, to talk with the inhabitants, and to better understand the entire process of assessment of vulnerability. The teaching and working methods that were used during the summer school were the lecture, the case-study assignment, the teamwork, and the brainstorm method.

Keywords*: Heritage preservation; Education; Architecture; Multidisciplinarity; Interculturality*

Introduction

The social revolution caused by the popularisation of synthetic polymer-based products has also influenced the arts. Since 1930, acrylic emulsion and alkyd paints have been progressively incorporated into the artist's palette [1].

Summer schools represent a useful tool for architecture students and not only to experience different approaches to the theoretical notions that they learnt in school. Moreover,

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it represents a good opportunity for interacting with other students and tutors and to be able to approach a subject from various perspectives.

Connecting students from architecture and other domains, such as engineering, urbanism, and sociology, can be a difficult task, but the digital tools always represent a sustainable tool for teaching multidisciplinary teams [1].

One of the most difficult aspects of teaching architecture students is being able to create the proper link between theory and practice. This gap between the two aspects can be reduced by involving students in case studies activities or real-life projects. This way, they will have the chance to explore the real nature of the problem, to base their approach on critical discussion and debate, and to assess the issue under the guidance of a tutor [2]. Moreover, the interaction with other students, especially from other study fields, will help the architecture students to enhance and produce holistic solutions and to be more prone to collaboration, critically thinking, and implementing various learning strategies [3].

So, following the courses of a summer school represents a form of inclusion of elective courses, which showed to be very effective for establishing a mutual relationship between education and profession. This kind of activity that students choose to follow, in dependance of their preferences and interests, can flexibly address a specific interest topic, a generalisation, or a specialisation [4]. The taxonomy of the architectural teaching process is illustrated in Figure 1, highlighting the importance of the skills courses as well as of the elective specialised courses in architecture [5].

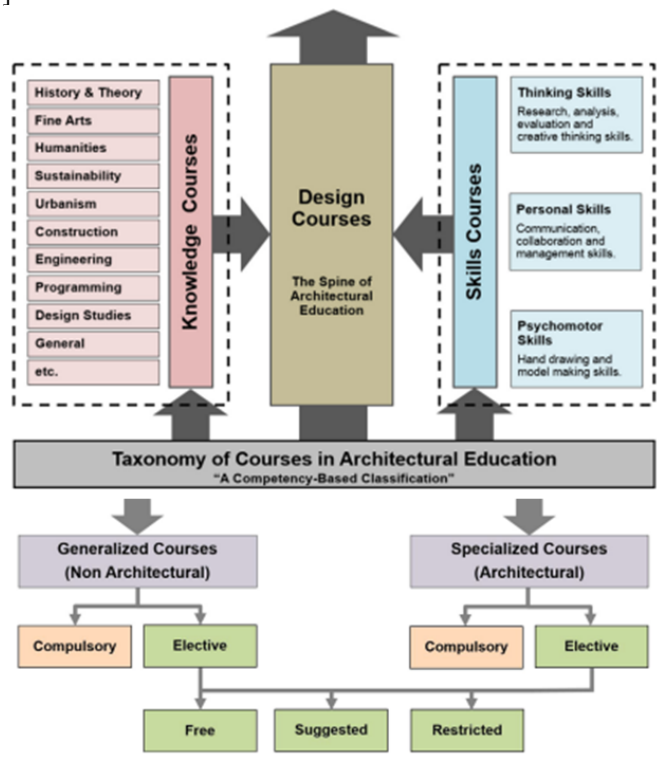

Fig. 1. The taxonomy of the architecture study process by Ghonim M. (2017) [5]

The summer school was organised within the Faculty of Architecture and Town Planning of Timișoara, with the participation of 28 Romanian students and 4 German students. The site visit and investigation activities were carried out with physical presence, while some common and joint studies were made online. There was selected a group of six historical buildings in Timișoara city, a very homogenous group from an architectural point of view. The

students were involved in 3 teams, each of the teams receiving the task to perform assessments for two of the six buildings. They were divided into other small sub-groups, receiving tasks such as historical analysis, urban and architectural investigation, socio-economic assessment, complete survey, plans and facade drawings, making the digital tridimensional model, assessing the seismic vulnerability, and determining the vulnerability index, or creating the architectural scale model. At the end of the activity, the students were involved in a small social event to exchange ideas, and they were also asked to fill out a feedback form. The aim of the summer school was to increase collaboration and multidisciplinarity in the students' work.

Urbanistic and architectural analysis of the case-study area

The case study area was selected to be in Timișoara historical city, which is the European Capital of Culture 2023. The investigated historical buildings are in the Elisabetin neighbourhood, a rural-urban residential historical area of the southern Timișoara city [6], that continued to grow until nowadays with an inward tendence [7], as presented in Figure 2 [8].

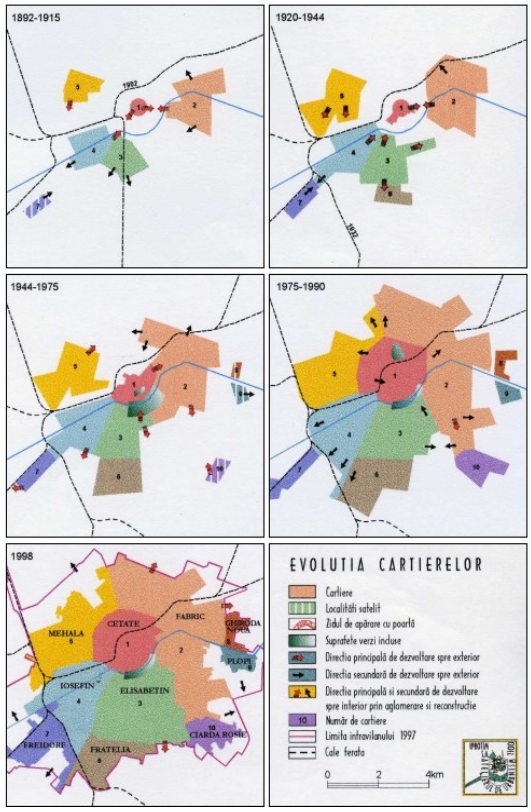

Fig. 2. The urbanistic development of Timișoara city, with the Elisabetin neighborhood marked in green [8]

There was selected a small aggregate of six historical buildings, built after 1900, right near Plevnei Square, at the intersection of Brașov Street and Gheorghe Doja Street, in the vicinity of the Gheorghe Doja Park, as presented in Figure 3.

Fig. 3. The case-study buildings – aerial view

From an urbanistic point of view, the case-study buildings are built within a closed aggregate, forming a closed perimetral area with an interior common courtyard. They present L and U plan shapes, creating a continuous and solid limit to the street path, as shown in Figure 4.

Fig. 4. Analysis of the physical limits of the case-study group of buildings

The heights of the buildings are quite similar, as two of the building's present basement, ground floor, and one floor above, while the other four buildings present basement, ground floor, and two floors above (Fig. 5).

Fig. 5. Analysis of the height regime of the case-study group of buildings

The chromatic of the facades is warm, specific to the architectural style Art Nouveau and Secession, dominated by pastel colours, with chromatic accents on the artistic details (Fig. 6).

Fig. 6. Chromatic analysis of the case-study group of buildings

Another element that was noticed to be present at all investigated buildings is the highlighting of the horizontal registers and of the massive base plinth of the buildings, as shown in Figure 7.

Fig. 7. The accentuation of the buildings base for some of the case-study buildings

Regarding the facades, there can be found similar opening percentages between the adjacent buildings. The openings are placed with perfect symmetry on the main facades and with many vegetal symbolic details, as presented in Figure 8.

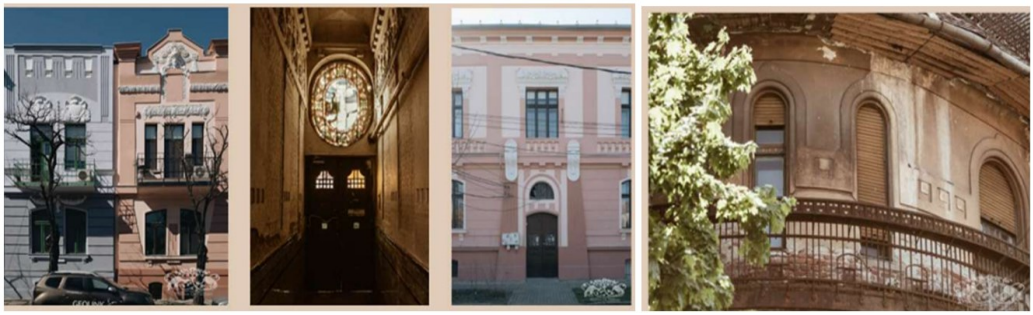

Fig. 8. Facade details of the case-study group of buildings

The area was in the past a residential area, but nowadays there can also be found small commercial spaces on the ground floor of the buildings and small private offices in the basement or in some apartments in the historical buildings (Fig. 9).

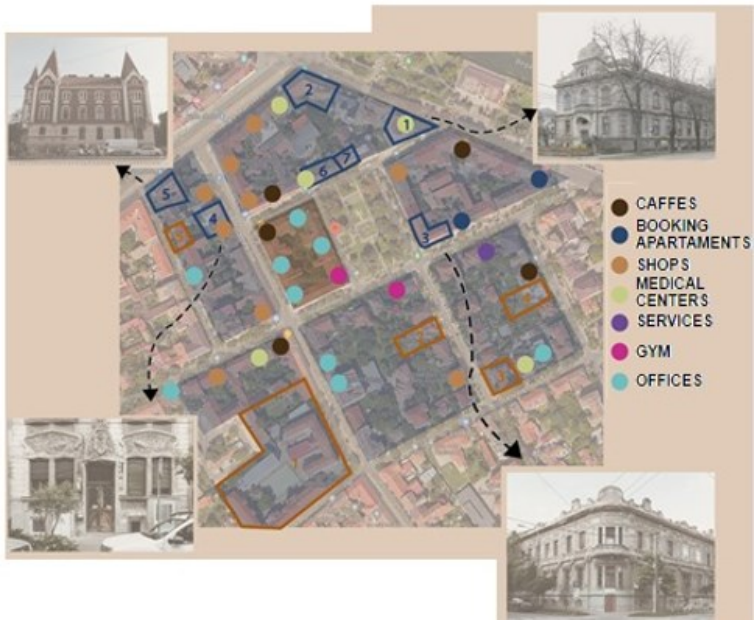

Fig. 9. Functions analysis for the case-study area

The first building of the aggregate, the House of the widow Lajos Blau (Fig. 10), was built in 1907 with a basement, ground floor, and one upper floor by the local architect Eduard Reiter and is nowadays part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regional monument. The building was designed as a two-story residential house with the same layout as the other buildings in the area. However, the owner, widow Lajos Blau, requested her house to be decorated with more geometric and less anthropomorphic elements than the ones specific to the architectural style [9,10].

The building was renovated 2 years ago and has 10 apartments. 8 of them apartments are used for residential purposes, while 2 apartments are rented for an architectural office. Based on the on-site survey that was conducted by the students, almost 20 people are living in the building, while the other 10 people are working in the rented office space [11].

The second building of the aggregate, the House of Dezso Marx, and his wife (Fig. 11), was built also in 1907 and was designed by the same architect, Eduard Reiter. The house is also part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regional monument. Some representative architectural details for the Secession architectural style can be seen, such as the bow-window on the corner of the building, facing the park, the medusa motif with vegetal elements, and the massively decorated wooden door that faces Plevnei Square. Even if the layout of the building and the chromatic aspects are typical for the architectural style, here can also be seen the specificity of that time, in which the owner of the building influenced the decorations independently of the architect [9,10]. The building is mixed-use, as in the basement there can be found a salsa dance studio, while on the ground floor there are several offices for real estate companies, IT, and accounting offices. A permanent number of 7 people are working in these offices, while some of them are in the course of remodeling. The other five apartments are used as residential spaces, while 13 to 15 people are estimated to live there [11].

The third building of the aggregate, the House of Johann Hartlauer (Figure 12), was also built in 1909 and was designed by the architect Martin Gemeinhardt for the owner named Johann Hartlauer, who was a tailor at that time. The house was built with a basement, ground floor, and two levels above, with a ground floor that is strongly marked through horizontal elements. The ground floor presents higher ceilings, and the upper floors present apartments for rent. The entire facade of the building is made very symmetrical, with several vertical decorative elements and with the theme of the "Green Man", a typical theme for the architect Gemeinhardt's work. The house is also part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regionalal monument [9,10]. The building located in Plevnei Square no. 5 has 8 apartments, of which six are permanently occupied today. Four apartments have permanent residents, around 10 people, while 2 apartments are rented out and two of them are empty now. There aren't any commercial spaces or offices in this building because permission for such activities is not given by the owners [11].

The fourth building of the aggregate, the House of Dr. Adolf Vertes (Figure 13), was built also in 1910 and was designed by the office of the architect Laszlo Szekely for the owner named Dr. Adolf Vertes, who was a very famous lawyer of that time, chess player, and one of the most important public figures in the early 20th century in Timisoara. The house was built with a basement, ground floor, and two levels above, in Secession architectural style. The building presents some dominant rounded balconies, while the facades and the inner staircase, as well as the balconies, are richly decorated with wrought iron railings. The artistic decorations are also vegetal ones, dominated by the motif of tulip. There is also a dominant medallion featuring a girl playing the violin on the northern façade of the building. The house is also part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regional monument [9,10]. The building located on General Henry Berthelot Street no. 5 contains 8 apartments and 3 commercial spaces in the basement, with separate entrances (only one of them is used at the time of the analysis; the other two are empty). The residential apartments have mostly permanent residents, as they were retroceded to the tenants in 1990. There are estimated 28 people to live there, and the building wasn't restored recently, mainly due to the age of the owners and their small income [11].

Fig. 10. The House of the widow Lajos Blau

Fig. 11. The House of Dezso Marx and his wife

Fig. 12. The House of Johann Hartlauer

Fig. 13. The House of Dr. Adolf Vertes

The fifth building of the aggregate, the Martin Gemeinhardt Palace (Figure 14), was also built in 1909 by the architect Martin Gemeinhardt but was sold only two years later to Phillip Izidor. The house was built with a basement, ground floor, and two levels above, in Secession architectural style. The shape of the building is an L-shape, with designated commercial spaces on the ground floor with an arched entrance door at the rounded corner of the building, and with ten apartments with a total number of 39 rooms, disposed on three floors. The house is also part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regional monument [9,10]. The building located on General Henry Berthelot Street no. 7 has an important commercial space at the corner of the buildings that is used as a cafe, used by the local community. Another commercial space is used by a leather manufacturer, with a separate entrance, in the basement. Beside the commercial spaces, there are 10 apartments in the building, of which 5 are office spaces that can be found in the building, one of them being an architecture office. Three apartments are used as holiday accommodation, and two apartments are currently under renovation. The situation in this building is very strange, as 90% of the spaces have just one owner, with no people living there. According to the neighbours, the asked

rent is too high for individual residents or families, so small offices are expected to move there in the next few years [11].

Fig. 14. The Martin Gemeinhardt Palace

The sixth building of the aggregate, the Jakab Klein and Mikos Frecot Palace (Figure 15), was built also in 1908 by the architect Gabor Fodor on a plot that was bought together by Jakab Klein and Gabor Fodor. The name of the architect can be found in a small cartouche next to the entrance. The house was built as a two-story building with several vertical decorations and three balconies as accents on the rather simple and clearly designed main facade of the building. The house is also part of the urban site „Old neighbourhood Iosefin TM-II-s-B-06098", which is classified as a regional monument [9,10].

Fig. 15. The Jakab Klein and Miklos Frecot Palace

Only a year ago, the palace was restored, and the facade was remade with fresh new colors. The building located on Gheorghe Doja Street no. 3 in Timișoara has 6 apartments, which were lately divided into 10 spaces. Almost all of the spaces are used for residential purposes and are owned by their inhabitants. There are estimated to live there around 14 to 16 people, and there aren't any commercial spaces in the basement or ground floor [11].**Case study area socio-economic analysis**

All the investigated buildings were built between the years 1867 and 1918, so in the period when Timișoara was under the administration of the Austro-Hungarian Empire, which represents a time of great transformation and modernisation for the city [12]. Foreign investments help the city to develop its economy, infrastructure, industry, and architecture. Strong migration fluxes developed the diverse social profile of the city, with a significant impact on the heritage, which is still valuable today. Moreover, the cosmopolitan elite of the city that was brought to Timișoara contributed to a closer position of the city to Europe, making Timișoara a European city [13]. The demographic rise during the last decades of the 19th century was followed by various social developments, through the new creation of schools, cinemas, theatres, and other spaces for the local community [12].

After the fall of the dualist pact of the Austro-Hungarian Empire, Timișoara started to be populated with more Romanians, which overcame the former majority of Germans and Hungarians. The population rose greatly from 1917 till 1930, with almost 30% [14].

After the Second World War, as part of the communist Eastern Bloc, the city starts a dynamic process of industrialisation, urbanisation, and modernization. Until the year 1984, Timișoara reaches more than 300.000 inhabitants, a 200% increase since 1930 [12]. After the fall of the communist regime in 1989, many former owners received back their houses, which were initially taken away by the government.

The case study area of the paper was planned as a residential neighbourhood for wealthy residents without any commercial uses [15]. All six buildings within the investigated aggregate are nowadays representative examples of the Secession architectural style in the early 20th century in Timișoara [9].

The economy of the city is a dynamic one, encouraged by the geographical position of Timișoara next to Serbian and Hungarian borders, with more than 30.000 active companies and an increasing tendency, as shown in Figure 16 [16].

Fig. 16. Number of active companies in Timișoara

The case-study area is located in the proximity of the city centre, with residential predominant spaces and few commercial spaces and business offices. According to an interview that was carried out by the students [11], the area was described as a calm area with light traffic and generous public outdoor spaces. On the other hand, the respondents claimed that the renting prices are very high, leading to numerous empty apartments in the historical buildings. Because the traffic is light, all the businesses in the area depend on pedestrian traffic, which is also a light one, so small businesses do not survive in the area for a long time. Small engineering, architecture, law, IT, and accounting offices are the ones that attract new people to the area. Moreover, an economically active hotspot can be found along the Gheorghe Doja Street, next to the case study buildings, with a small brewery, medical cabinets, and some international company offices. The economical hotspots in the area are shown in Figure 17 [11].

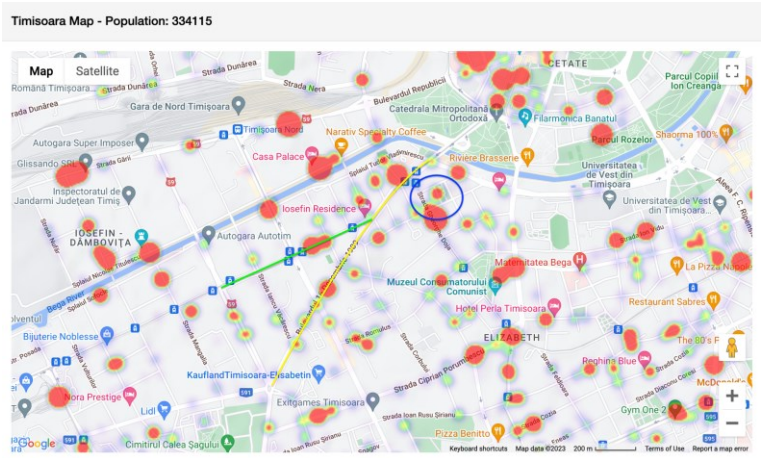

Fig. 17. Economic hotspots in the area

After investigating and correlating all the previous aspects, it can be said that the area can be described as a residential one with a valuable vicinity to the city center. Property value is relatively high, especially because of the location of the group of buildings, but also because of the recent renovation work performed on most of the case study houses. Rents are described as expensive and higher than the average rent in the city, so it can be concluded that the people that are living in those buildings are either inhabitants since the fall of the communist period and own the spaces or are wealthy individuals that seek a good location within the city.

From a social point of view, the case study buildings are inhabited by a demographically diverse population. The owners of the buildings usually represent the elderly population, while the renters of the other apartments represent the young population. Residents value the location for the calm and quiet character of the surroundings, the good connections with the city centre, also by public transportation, and for the green spaces nearby. Despite the high renting prices, the overall occupation rate of the case study buildings is just under 90% (Table 1).

Out of 33 total apartments in the investigated six buildings, only two are empty at the moment, while out of the total number of 20 office spaces, only four were observed to be unoccupied. Overall, in all six case-study buildings, there were determined to be 53 spaces, of which 33 are used for residential purposes and 20 as offices, with a 94% occupancy rate for the residential spaces (Fig. 18) and an 80% occupancy rate for the office spaces (Fig. 19).

Table 1. Overview of the number of apartments and offices in the case study buildings

	Bld. 1	Bld. 2	Bld. 3	Bld. 4	Bld. 5	Bld. 6	Total no.
Residential	8	5	6	8	0	6	**33**
Occupied	8	5	4	8	0	6	31
Empty			2				2
Inhabitants	20	14	10	28	0	15	**87**
Offices	2	2	0	3	11	0	**17**
Occupied	2	2	0	1	9		15
Empty				2	2		4
Total							
Persons	10	14	0	1	30		55
Total Persons	30	28	10	29	30	15	**142**

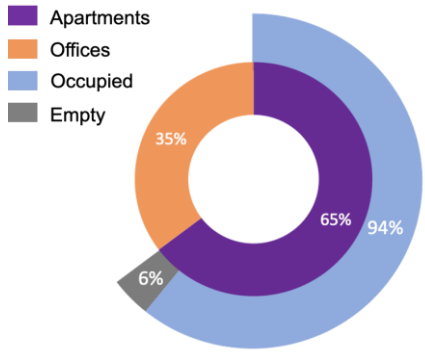

Fig. 18. Occupancy rate for residential spaces in the case-study buildings

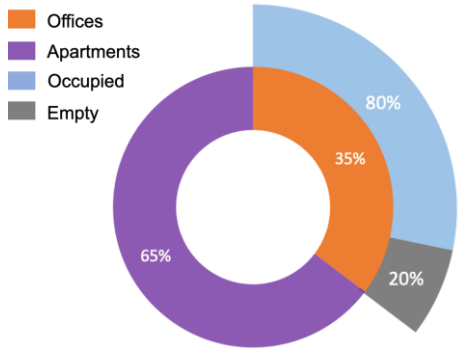

Fig. 19. Occupancy rate for office spaces in the case-study buildings

The interview that was carried out by the students in the area had the aim of determining the perception of the inhabitants about the cultural value of the case study buildings and about the social and economic context of the area. The interview was organised in 3 main parts,

regarding the historical dimension, the socio-cultural dimension, and the economic dimension, with several questions on each item, as presented below:

- Historical dimension
- Is the history of the building of importance to you?
- Do you consider that the buildings have importance for the memory of the local community?
- Social/cultural dimension
- How many people live or work in these spaces?
- (for offices) What type of work do you do?
- Are there any cultural events taking place here?
- What is your profession/job?
- Why did you choose to live/work here?
- Do the residents/offices usually stay for long?
- Is it interesting for young people to live there?
- Do you find the area appropriate for living?
- Economic dimension
- How dependent is your home/business on the location?
- Is it an international or local business?
- Do you know how much would cost to buy an apartment or the entire building?
- Are you spending time and resources in this district or nearby?
- Have the buildings or apartments been sold out at some point?
- How much did you pay and when?
- Do you have the impression that prices have been rising recently?

The transformation in the social and urban landscape that took place at the end of the 19th century led to a particular mix of ethnicities in Timișoara, which is considered to be an advantage that created a more tolerant and open social climate. In the case study area, the conflict between the need for rehabilitation work and maintenance of existing social structures can be noticed. On the one hand, the buildings have a high historical and economic value due to their location and cultural value. On the other hand, many apartment owners cannot afford restoration work, leading them to not rehabilitate at all the buildings or sell them out, which changes the social structure of the area. The seismic risk assessment should therefore relate to measures to make rehabilitation work financially feasible and to preserve the socio-cultural components of the area.

Multidisciplinary vulnerability assessment and workshop results

Vulnerability assessment represents a common tool in the process of understanding the opportunities and risks of specific historical buildings. Seismic vulnerability, in particular, influences not only the economic value of the case study buildings but also the social perception of their inhabitants.

Timișoara city is located in the Banat seismic area, which is characterised by shallow earthquakes of crustal type with focal depths of 5-20km, an assigned PGA of 0.20g [17], a maximum recorded magnitude of M= 5.6, and two seismic faults in the western part of the city [18, 19], located at under 5km distance from the case study area [20].

The first step for assessing the vulnerability is to establish the most probable seismic scenario for the area by considering Equations 1 and 2 [21], which allows us to determine the most probable expected macroseismic intensity based on parameters such as PGA, focal depth, and epicentral distance.

$$IEMS\text{-}98=1.45 \times MW-2.46 \times \ln(R)+8.166 \quad (1),$$

where: R represents the relationship between the epicentral distance d and focal depth hf:

$$R = \sqrt{(d2+hf2)} \quad [km] \quad (2)$$

The possible seismic scenarios for the investigated area are presented in Table 2 [22], highlighting the most probable macroseismic intensity IX EMS-98 for the investigated area.

Table 2. Possible macroseismic intensities for Timișoara city

M_W	d [km]	h_f [km]	I [EMS-98]
4	5	5	**IX**
	10	10	VII
	15	15	VI
	20	20	VI
5	5	5	XI
	10	10	**IX**
	15	15	VIII
	20	20	VII

All six investigated buildings are made of masonry of burnt clay brick and lime, with thick perimetral and median longitudinal walls and thin transversal walls. At the basement and ground floor, there can usually be found masonry vaults and arches, while at the upper floors, there can be found wooden floors or even reinforced concrete slabs in the buildings that were retrofitted recently (Fig. 20) [23].

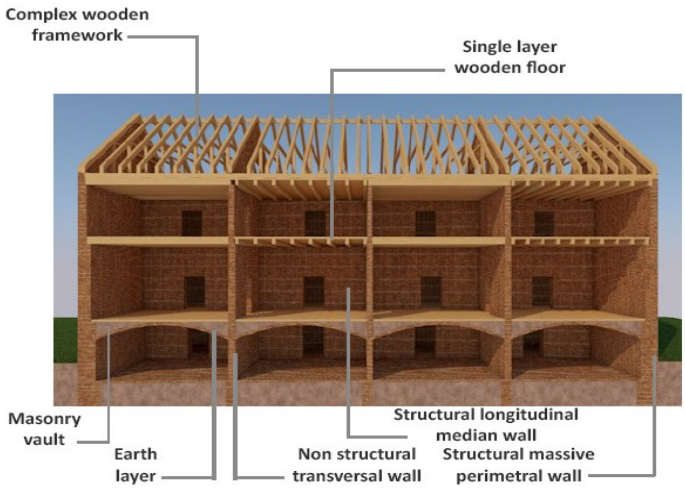

Fig. 20. Typical structural system for the case study buildings

The multicriterial vulnerability assessment of the six case study buildings in Timișoara city was determined following an original methodology of the author [23]. The procedure starts from a well-known empirical vulnerability assessment method, developed by prof. Benedetti and prof. Petrini years ago [24] and recently developed by prof. Formisano and prof. Mazzolani [25], to also consider the influence of the adjacent buildings. Furthermore, the methodology was developed by the author of this paper to consider also the architectural, urbanistic, and socio-economic components and was also calibrated by Onescu and prof. Mosoarca [21] for the Banat seismic area. The procedure is based on a vulnerability form with 42 parameters related to the structural, architectural-artistic, urbanistic, and socio-economic vulnerability of the investigated building that aims to define a multicriterial vulnerability index, obtained as the sum of each individual score of the assessed vulnerability class multiplied by the associated weight (Equation 3), as presented in Table 3 [26, 27].

$$I_{V\,CULT} = 0.70 \times \sum_{i=1}^{15} s_i \times w_i + 0.15 \times \sum_{i=16}^{33} s_i \times w_i + 0.10 \times \sum_{i=34}^{38} s_i \times w_i + 0.05 \times \sum_{i=39}^{42} s_i \times w_i \quad (3)$$

Table 3. Multicriterial vulnerability form

%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT
				A	B	C	D	
70 %	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1
		2	Nature of vertical structures	0	5	25	45	0.25
		3	Location of the building and type of foundation	0	5	25	45	0.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5
		5	Regularity in plan	0	5	25	45	0.5
		6	Regularity in elevation	0	5	25	45	1
		7	Type of floors	0	5	15	45	1
		8	Roofing	0	15	25	45	0.75
		9	Details	0	0	25	45	0.25
		10	Physical conditions	0	5	25	45	1
		11	Presence of adjacent buildings with different height	-20	0	15	45	1
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5
		13	Presence and number of staggered floors	0	15	25	45	0.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1
						IV STR 15		
15 %	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5
		17	Age, importance of the build époque	0	10	15	25	1.2
		18	Original woodwork/joinery	0	10	15	25	1
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1
		20	Original statues or bass-reliefs	0	10	15	25	1
		21	Original gable/fronton	0	10	15	25	1
		22	Original balconies and railings	0	10	15	25	1
		23	Original mosaics or stone work	0	10	15	25	1
		24	Original paintings or frescoes	0	10	15	25	1
		25	Conservation state of artistic assets	-5	10	15	25	1
		26	Authenticity/ originality (global, elements)	0	10	15	25	1
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5
		28	Particular construction techniques/materials	0	10	15	25	0.5
		29	Conservation state of original materials	-5	10	15	25	0.5
		30	Representative historical events	0	10	15	25	0.5
		31	Archaeological site	0	10	15	25	1.5
		32	Representative/ original wooden framework	0	10	15	25	1
		33	Past restoration work	-5	10	15	25	1
						IV ARCH		
10 %	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1
		37	Location (central area, touristic area)	0	10	15	25	1.5
		38	Representative/particular shape of the roof	0	10	15	25	1
						IV URBAN.		
5 %	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5
		40	Importance for the local community memory	-5	10	15	25	1
		41	Economic value	0	10	15	25	1.5
		42	Cultural functions	0	10	15	25	1.5
						IV SOC.		
						IV CULT		

The last step in the process of assessing the multicriterial vulnerability assessment is to determine the most probable damage state and the vulnerability curve for a specific macroseismic intensity by following Equation 4 [27], where Iv cult represents the vulnerability index that is determined based on Equation 3 and a variable Φ that influences the curve slope, which is considered to be 2.3 for residential buildings [28].

$$\mu_D = 2.5\left[1 + \tanh\left(\frac{I + 12.50 \times V_{CULT} - 13.1}{\Phi}\right)\right] \quad (4)$$

The results of the multicriterial vulnerability assessment of the six case-study buildings are presented in Figure 21 (values of the vulnerability indexes). Moreover, for the most probable IX EMS-98 macroseismic intensity, the vulnerability curves for all the investigated buildings (Fig. 22) and the mean vulnerability curve (Fig. 23) indicate that there can be expected a most probable D2 damage state, with the possibility of reaching a D3 damage state,

meaning that there could be damages to non-structural elements and very light damages to structural ones. Since the investigated buildings present a large number of architectural-artistic assets, most of them non-structural elements, even the moderately expected damage state could lead to the loss of such valuable assets.

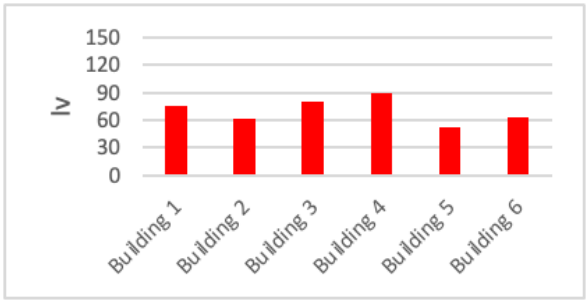

Fig. 21. Vulnerability indexes for the six investigated buildings

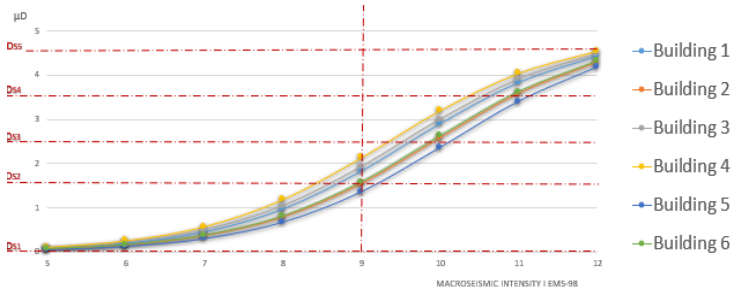

Fig. 22. Vulnerability curves for the six investigated buildings

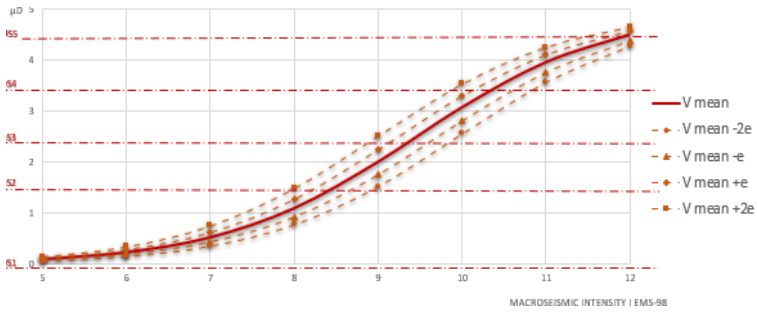

Fig. 23. Mean vulnerability curve for the six investigated buildings

The overall low to medium vulnerability of the investigated buildings is explained by the fact that the group of buildings is in a very good state of conservation, with many of the houses being restored recently, and there aren't any structural alterations that could affect the stability of the buildings in case of an earthquake.

The final results of the summer school consisted of a large package of work that contained:

- Historical analysis of the area and of the buildings
- Urbanistic analysis of the area and indicators for the buildings (Table 4)
- Architectural-artistic analysis of the buildings

- Social analysis of the inhabitants
- Economic analysis of the group of buildings and neighbourhood
- Complete survey of the six buildings (Fig. 24)
- Photographic database
- 3D digital model of the buildings
- Physical model of the six investigated buildings (Fig. 25)
- Vulnerability form fulfillment
- Multicriterial vulnerability assessment
- Written report

Table 4. Urban indicators for the six buildings

Bld.	Gr. floor surface (m2)	No. of floors (with basement)	Total surface (m2)	Max. Height (m)
1	551	3	1653	12,90
2	567	3	1701	12,90
3	439	4	1756	15,20
4	516	4	2064	17,32
5	579	4	2316	14,90
6	531	4	2124	14,02

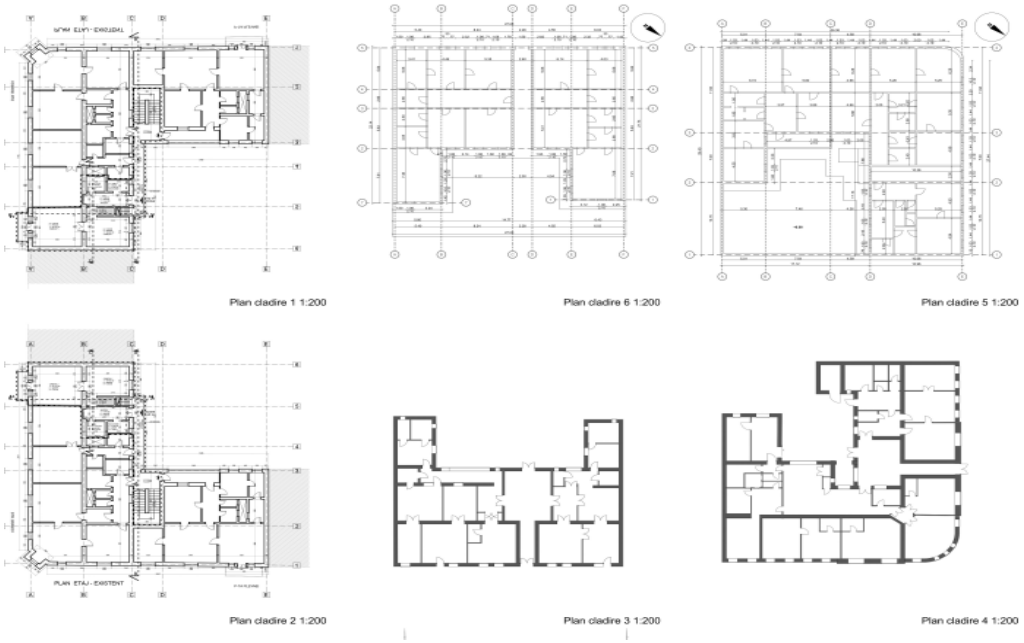

Fig. 24. Survey of the six investigated buildings

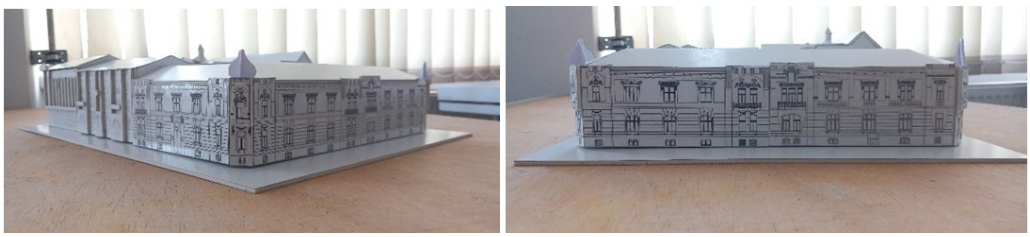

Fig. 25. Photos of the model that the students made

Feedback from participating students

At the end of the activity, all the students were requested to fill out a feedback form, with the aim of assessing their satisfaction level with the performed activities within the summer school. The form was developed by the author, with a total number of 15 items that focused on topics such as:

- Clarity of the information and requests
- Expectations
- Utility of the summer school
- Difficulty of the tasks
- Opportunities and utility of the learned aspects
- Satisfaction level
- Interest for similar future workshops
- Interest for research in similar topics
- General feedback and recommendations.

The first question was related only with short details about the participation of the students (from Romania or from Germany, to be able to sort the answers), without any personal information.

At the second question, where the students were asked how clear the information was, by choosing from a scale from 1 (not clear at all) to 5 (very clear), all the students responded that the information was clear, as presented in Figure 26.

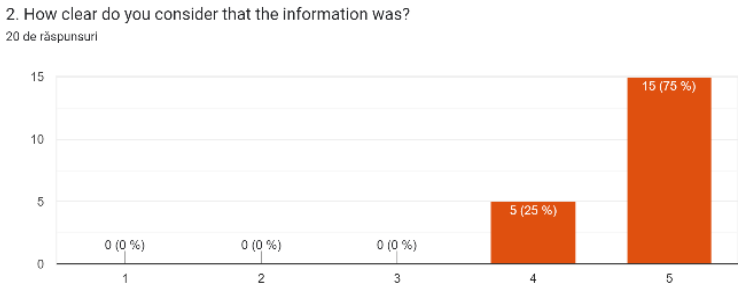

Fig. 26. Answer to the question: How clear do you consider that the information was?

The third question was an open question, aiming on finding out what the student learnt after the summer school, and the answers were diverse, with just a part of them highlighted below:

- They learnt how to conduct a survey, to work in a team, and to appreciate the classical architecture of the city.
- They learnt how to work with other colleagues and new people.
- They learnt how to correlate their work with other team members and how to complete a vulnerability assessment.
- They learnt more about the history and architecture of Timisoara city, and they had the chance to learn how to work in international groups from different specialities.
- They learnt about the importance of vulnerability studies.

The answers were diverse, but more than 90% of the respondents said that they learnt better how to work in a team and that the multicultural activity was really a rewarding experience, highlighting the value of the international and multicultural aspect of the summer school.

The fourth question aimed to find out if the workshop activities were according to the student's expectations. The responses were also based on a scale from 1 (not at all; I expected more from the workshop) to 5 (yes, it was way better than expected), showing the fact that most of the student's expectations were satisfied or even exceeded (Fig. 27).

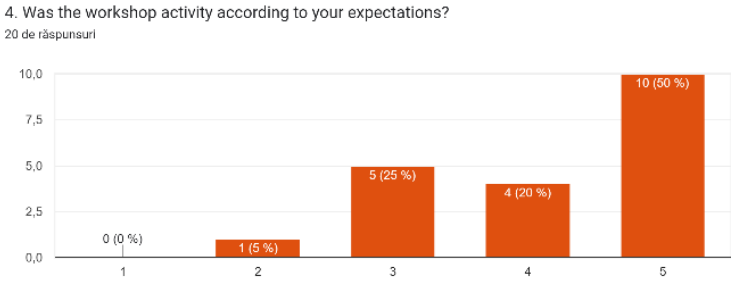

Fig. 27. Answer to the question: Was the workshop activity according to your expectations?

The next question was also a scale question, asking the students how difficult the task was. The responses were also organised on a scale from 1 (not difficult at all) to 5 (very difficult), and 90% of the respondents considered that the assigned tasks were not difficult at all or manageable (Fig. 28).

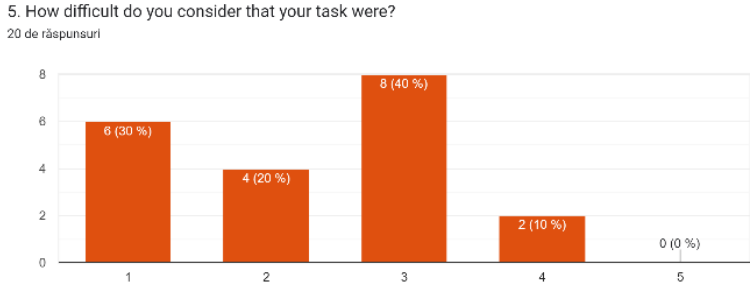

Fig. 28. Answer to the question: How difficult do you consider your task was?

The sixth question was an open question, aiming to find out if the students believe or not that the activities performed during the workshop will somehow help them in the future, and some of their answers are highlighted below:

- The workshop made them appreciate the teamwork effort and pay attention to every architectural detail.
- It helped them to organise their time and effort better.
- It will help them to communicate better with other people.
- Will help them by increasing their awareness level of the importance of building's vulnerability.
- The workshop helped the students to upgrade some technical skills and knowledge.
- It will help them in the future by learning how to investigate the urban area in a quicker and simpler way and how to have a better workflow.

The seventh question aimed to find out how interesting the summer school was for the participants by asking them to assign a score from 1 (not interesting at all) to 5 (very interesting). All the students considered that the activities were quite interesting or even very interesting, as shown in Figure 29.

Fig. 29. Answer to the question: How interesting do you consider that summer school was?

To the question about the availability and help offered by the workshop tutor, all the students answered yes.

The next question was related to the previous one, asking the participants about their satisfaction level with the tutor's lecture and help. The answers were organised on a scale from 1 (not satisfied at all) to 5 (very satisfied), and all the students answered that they were quite satisfied or even very satisfied (Fig.30).

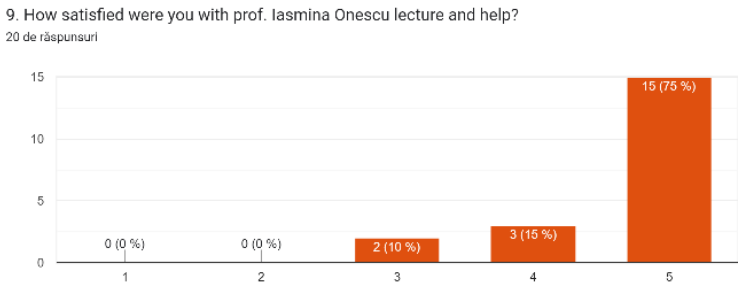

Fig. 30. Answer to the question: How satisfied were you with the tutor's lecture and help?

The following two questions were yes or no questions, regarding the consideration of recommending this summer school to other colleagues or regarding their intention to attend similar workshops in the future. All the participants responded affirmatively to both questions.

The next questions were also yes-or-no questions, asking the participants if they would consider after this experience applying for mobility in another country or to do research in the field of vulnerability. The respondents said that 75% of them would consider having mobility abroad, and 75% would be interested in doing research on similar topics in the future (Figure 31).

At the end of the feedback form, the students were asked to measure their satisfaction level after the workshop from a scale from 1 (not satisfied at all) to 5 (very satisfied), all of them saying that their satisfaction level was good (Figure 32).

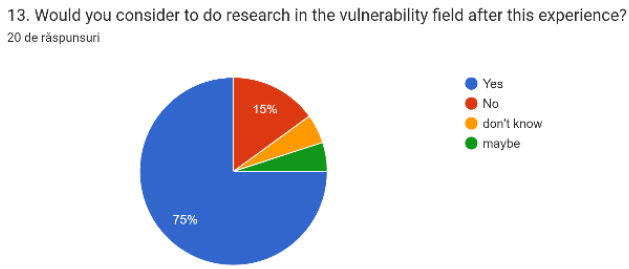

Fig. 31. Answer to the question: Would you consider doing research in the vulnerability field?

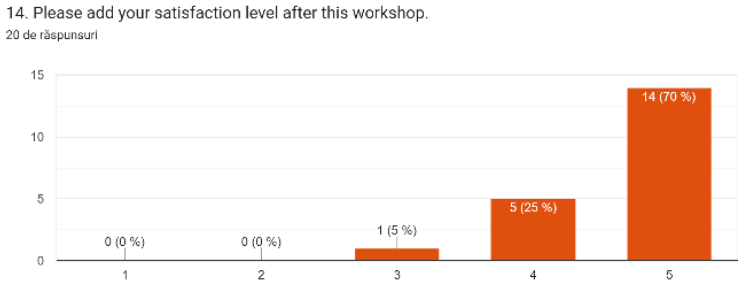

Fig. 32. Answer to the question: Please add your satisfaction level after this workshop

Moreover, they were asked to give overall feedback or a recommendation, and some of their answers are concluded below:

- The students learnt many new things and considered the experience wonderful.
- Students appreciate the liberty of working with a flexible schedule but at the same time would have wanted to receive more input about how vulnerability can be accessed and assessed in detail.
- The students found the workshop helpful to develop not only architectural skills but also social ones.
- The students were very satisfied with the experience but would have appreciated a bit more of a social exchange with the other students.
- The respondents considered that the tasks were assigned in a balanced way and the activity was a pleasure.
- The students appreciated the international and multicultural aspect of the summer school because it helped them improve their teamwork and communication skills.
- Participants found the activities interesting, as it allowed them to interact with students from other study domains.
- Some of the respondents said that they found the workflow a bit challenging, but in the end, consider that it helped them with the time management skills.

All the answers to the general feedback were in a positive spirit, stating that all the participants had something to learn from this experience.

Conclusion

The summer school "Multidisciplinary vulnerability assessment of a historical district in Timisoara, European Capital of Culture 2023" was made with the first aim of putting together students from different cultures and different study domains to show them how multidisciplinary study can be done and to teach them about the simplified vulnerability assessment procedures.

The summer school was promoted through a website, https://sites.google.com/view/timisoara-daadsummerschool/pagina-de-pornire, where several information about the opportunity of the study theme, the methodology, program, location, application procedure, and deadline were published.

The participants were offered access to knowledge, which is a vital factor for the fulfilment of individuals and collectives, possible through multidisciplinary and holistic approaches. The things learnt by the students will offer them a new perspective in their future work, helping urbanisation be sustainable in the future.

The summer school was a multi-, inter-, and transdisciplinary work that highlighted that besides understanding the structural behaviour of heritage buildings, there are a series of factors that have to be taken into account when assessing the vulnerability.

In conclusion, the summer school activities offered the participant students a multicultural experience, in which they learnt modern methodologies for assessing the multi-risk vulnerability of historical buildings in urban areas, but also helped them gain abilities of collaboration, communication, presentation, organisation, and others.

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