Cheia T – Technique, Technology, Transfer. 10 Key-Components for Sustainable Architectural Design

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Abstract. CHEIA T (*Holistic Research, Integrated Academic Expertise: Technique, Technology, Transfer*) was a research project initiated in 2022 by the Department of Technical Sciences, UAUIM. The three objectives of CHEIA T were transdisciplinary techniques approaches in architectural education, prefab building technologies analysis and sustainable knowledge transfer. The research team undertook a synthetic comparison of categories and items that configure the most important certification standards for sustainable buildings and filtered several elements having a direct influence upon the students' architectural proposals. We created a complex survey addressed to students in the final years of the Faculty of Architecture, aiming to assess different ways of integrating sustainable principles and technologies into their architectural design studio projects. 10 components of sustainable architectural design were defined: *Site, Inclusive Design, Air, Water, Sun & Light, Sound, Materials, Waste, Energy, Wellbeing*. Considering the four pillars of sustainability, the multiple-choice options presented in each of the 10 specific areas of the survey focused on the architectural form, architectural details, social and environmental aspects. The synthesis of the 10 key sustainable components emphasizing pragmatic solutions presented in this research paper can be used as a valuable tool in architectural education when generating new ideas for architectural projects.

1 Introduction

1.1. Sustainability in Architectural Design Approach

The building sector's dynamic shift towards sustainability along with current legislation developments demand a rethinking of the way students and teachers are trained in schools of architecture. Such changes involve continuous specialisation in sustainable design and require an integration of new knowledge and abilities into academic curricula.

CHEIA T (*Holistic Research, Integrated Academic Expertise: Technique, Technology, Transfer*) was a research project initiated in 2022 in the Department of Technical Sciences, "Ion Mincu" University of Architecture and Urban Planning (UAUIM), Bucharest, Romania. The project aimed to develop the collaborative nucleus of professionals formed in the first CHEIA research project (2021) [1] by deepening transdisciplinary approach techniques in architectural education, studying prefab constructive technologies, and generating sustainable knowledge transfer.

To accomplish this objective, part of the CHEIA T research focused on how students perceive and manage to implement sustainable principles, details and technical solutions learned during their academic studies into their own architectural design studio projects.

The following technical disciplines are mandatory in UAUIM for all students in the 4th and 5th year of study: *Buildings' Physics (2), Architectural Technology Design Studio (2)*, where the fire safety and the accessibility components were studied and *Architectural Technology Design Studio (4)*, focusing on integrating sustainability into the design studio architectural projects.

1.2. Certification Standards for Sustainable Buildings

For embedding sustainability into academic curricula, six certification standards were used as a starting point for developing a set of sustainable design criteria suited for 4th and 5th year students in architecture school.

BREEAM, LEED, LBC, EDGE, WELL, DGNB have common and specific sustainability criteria that must be met to achieve certification. By studying a synthesis of these various components, the team of teachers can work with students on applying sustainable principles into their own projects, so that students can further create original architectural designs.

The analysed standards provide a framework for sustainable architecture: planning, designing, building, operation and maintenance. Their goal is to offer principles, guidelines and best practices that can improve the architectural design of environmentally friendly, economically viable and socially responsible buildings.

BREEAM (Building Research Establishment Environmental Assessment Method) is a British standard which assesses the following 10 components: *Energy,*

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Health & Wellbeing, Innovation, Land Use, Materials, Management, Pollution, Transport, Waste, Water [2].

LEED (Leadership in Energy and Environmental Design) is a green building certification program with 5 rating systems and 9 credit categories: *Integrative Process, Location & Transportation, Materials & Resources, Water Efficiency, Energy & Atmosphere, Sustainable Sites, Indoor Environment, Innovation, Regional Priority* [3].

LBC (Living Building Challenge) is the first standard that dares to quantify "beauty" and comprises 7 categories, with 20 components: Place – *Limits to Growth, Urban Agriculture, Habitat Exchange, Human-Powered Living*; Water – *Net Positive Water*; Energy – *Net Positive Energy*; Health + Happiness – *Civilized Environment, Healthy Interior Environment, Biophilic Environment*; Materials – *Red List, Embodied Carbon Footprint, Responsible Industry, Living Economy Sourcing, Net Positive Waste*; Equity – *Human Scale + Humane Places, Universal Access to Nature + Place, Equitable Investment, Just Organizations*; Beauty – *Beauty + Spirit, Inspiration + Education* [4].

WELL certification scheme refers to well designed, well operated, and well maintained buildings for the wellbeing of the people who use them and includes the following 10 components: *Air, Water, Nourishment, Light, Movement, Thermal Comfort, Sound, Materials, Mind and Community* [5].

EDGE (Excellence in Design for Greater Efficiencies) has 3 levels of certification and 5 categories of study on different types of architectural programs: *Design, Energy, Water, Materials, Operations* [6].

DGNB (acronym for German Sustainable Building Council) follows the main 3 pillars of sustainable development, each having 3 components: Environmental Quality – *Climate Action and Energy, Water, Materials & Recycling*; Economic Quality – *Operating Costs, Risk Management and Long-term Asset Value, Procurement & Operations*; Sociocultural and Functional Quality – *Indoor Comfort, User Satisfaction, Mobility* [7].

2 Research Methodology

Our research team conducted a synthetic comparison of the criteria, categories, components and items that comprise sustainable architectural design. We selected specific items having a direct influence on the students' conceptual architectural proposals and details.

As a result, this study provides an original model analysis for the main research inquiry: *How do sustainable principles and technologies influence the architectural concept and technical solutions for the students' architectural design studio projects?*

An in-depth evaluation was undertaken by our research team regarding almost 200 projects delivered by UAUIM students in two disciplines focused on the topic of sustainable architectural design. The analysis aimed to retrieve the students' architectural concepts, functioning scenarios, and different proposals for incorporating bioclimatic principles, materials, constructive systems and building equipment.

A complex set of examples and technical solutions was conceived, with impact on the architectural form, architectural details, social and environmental aspects, grouped in 10 categories [2-17]. The questionnaire "Sustainability in Architectural Design Approach" was addressed to students in the final year of the Faculty of Architecture, UAUIM. The program consists in 6 years of full-time study, with a master's degree included, and qualification level 7 EQF. An online form included 28 questions grouped in 12 sections: contextual preliminary unit; central area with 10 specific questions engaging the outlined sustainable key components; final section about future professional development perspectives.

3 Architectural Design Tools: 10 Key Sustainable Components

This article will describe the technical architectural solutions presented in the main part of the "Sustainability in Architectural Design Approach" survey, in a descending order of the number of checked options. Students were able to choose as many options as they considered and had the opportunity to write a free separate answer to each of the 10 questions.

3.1. Site

The most implemented solutions that enable sustainable transport, biodiversity and reduce environmental impact were parking lots for bicycles and scooters, and the creation of an explorable landscape featuring trees, shrubs, plants, and other natural elements (lawn / rocks / gravel / sand / logs / roots / mounds of earth and grass etc.). Students included bike routes into their projects and facilities for bike riding such as storage spaces, changing rooms, showers, and toilets.

Additional solutions mentioned by respondents included creating walkways and clearing up ground floor areas to protect green spaces, providing a variety of outdoor dining places that are covered or shaded and connected to indoor spaces, and designing landscapes that can be enjoyed year-round.

Some students answered they reduced the footprint of new constructions on the site, preserved existing buildings or structures, or provided charging stations for electric vehicles. Other answers included vegetable gardens, flower gardens, greenhouses, and fruit trees. However, one respondent mentioned that they were not allowed to create greenhouses or gardens on their site.

3.2. Inclusive Design

Architectural design solutions can foster accessibility, orientation and signage, inclusive design for the widest possible range of users, considering permanent, temporary, or contextual disabilities. Main solutions implemented by the respondents were accessible elevators, pedestrian ramps with a slope of less than 8% and the reduction of the crossroads on the building site.

Other solutions included handrails at both 90 cm and 50-60 cm heights, separate adapted toilets for wheelchair

users, and compliance of most toilets to be accessible to wheelchair users.

Students also mentioned colour codes for distinct functional areas or access routes, integrated tactile-visual warning surfaces into floors and pavements, flooring finishes that allow orientation or unguided play. Some respondents suggested incorporating Braille information into handrails, door handles, and other objects, as well as using auditory cues to guide visually impaired people.

A few answers related to tactile cues for orientation, such as anti-slip tapes and changes in materials or textures, and integrating devices that activate the senses, such as projections, sounds, smells, heat, water, air currents, colours, or electromagnetic waves. Overall, respondents emphasized the importance of ensuring that all public spaces in a building are accessible.

3.3. Air

Configurations that provide ventilation, cooling, heating, indoor air quality, minimizing air pollution: use of thermal insulation and the avoidance of thermal bridges, as well as the strategic location of buffer spaces such as vestibules, hallways, corridors, dressing rooms, and attics were the most used solutions.

Some respondents included green roofs, urban agriculture, vegetal barriers to sources of pollutants, ventilated facades, or double-skin facades. Additional solutions mentioned by students included the use of low VOC (volatile organic compounds) materials, shaping building volumetry according to bioclimatic analysis, and orienting functions to consider sources of pollution, raised exterior flat roofs, cross ventilation, sloped ventilated roofs and planted areas such as greenhouses, pots, or hydroponic crops, green facades, vertical gardens, or green wall areas.

3.4. Water

The most used solutions for integrating water in architecture were rainwater retention basins and integration of water features such as ponds, fountains, and streams into the site design.

Other configurations included green areas with efficient irrigation systems, water reuse systems, and the strategic orientation of water surfaces to reflect facade areas. Some respondents also declared the use of special solutions for rainwater systems, such as gutters, downpipes, chains, and tanks, as well as providing access to drinking water through dispensers or drinking fountains and access to water for outdoor maintenance.

3.5. Sun & Light

Selected solutions for selective sun protection, minimum standard sunshine, natural and artificial lighting [10] were the use of volumetric extractions and additions such as terraces, balconies, loggias, entrances, passages, walkways, and porches, as well as the strategic orientation of certain functions in relation to the cardinal points or existing buildings.

Answers included the use of shading devices made of fixed slats exclusively in front of windows, slated sunshades (fixed or mobile, horizontal, or vertical) along the length or height of facades, and higher spaces that allow for deep natural light. Additional solutions mentioned by respondents included sun protection through the placement of trees, shrubs, and other vegetal elements on the site, interior courtyards / light courtyards, and sun protection through cantilevered roofs. Some respondents used fixed horizontal elements such as canopies or pergolas, glazed interior partitions to allow natural light into certain rooms or corridors, and designs that play with shadows and lights.

Certain answers referred to skylights, shutters, roller shutters or blinds, building orientation on the site to provide selective sun protection through volumetrics, glazed doors or doors with top glazed panels, and the arrangement of separate structures on the site or roof for shading different areas.

Students also mentioned avoiding artificial light pollution and other design features such as sliding panels on loggias, terraces or balconies, changes in angles in the horizontal or vertical plane of the facade, bay windows, different roof heights for using the resulting vertical surface for windows, sloped roof windows, toothed roof or facade shapes, solar collectors, or light tubes.

3.6. Sound

Architectural solutions for providing acoustic comfort and avoiding noise pollution referred mainly to transition spaces between quiet areas and potentially noisy zones, flooring with soundproofing underlay or raised flooring, wall compositions with noise insulation performance and placement of vegetal acoustic barriers on the site.

Students also used sound-absorbing interior treatments for walls, ceilings, floors or furniture elements, volumetric conformation of certain spaces avoiding the parallelism of the interior walls and facades finished with materials that absorb airborne noise.

A few answers stated the integration of full screens on the building's roof to reduce the noise level produced by technical equipment or acoustic barriers on the site (massive panels / walls, etc.).

3.7. Materials

Sustainable solutions for building materials and finishing systems used in students' architectural design projects were mainly dry or mechanical finishing systems, triple glazed windows or exterior doors, and materials with Environmental Product Declarations (EPDs).

Other mentioned solutions were windows mounted in the plane of the external thermal insulation, thermal mass wall or floor areas, and materials that change colour over time. Some respondents also mentioned Phase Changing Materials (PCM) and Trombe walls.

3.8. Waste

Sustainable waste management solutions assuring the "3R" concept (*reduce, reuse, recycle*), modularity and prefabrication [11] were integrated by some of the respondents: waste reduction through modularity and prefabrication, outdoor selective waste collection areas and indoor selective waste collection containers.

A few students stated the use of recovered materials or composting systems located on the site. A relevant percent of 40% of the respondents did not at all consider waste management in their projects.

3.9. Energy

The most used configurations for generating energy from renewable sources were roof BIPV (Building Integrated Photovoltaics), followed by solar panels for DHW (Domestic Hot Water), facades / railing BIPV and photovoltaics detached from the roof plane. 19% of the students did not integrate any solution into their projects.

Only a small number of respondents referred to outdoor seating places equipped with sockets, connected to "photovoltaic trees" or other devices that capture solar energy, sun shading devices or outdoor covered parking areas that incorporate photovoltaics, wind turbines or geothermal energy systems.

3.10. Wellbeing

Students emphasized architectural solutions fostering users' wellbeing, health, nutrition, practicing sports and playful activities, active participation in the community life. The most popular integrated configurations were facilities for cyclists and designing transition spaces or interior areas to foster community interaction.

Additional solutions referred to functions provided for various social and cultural activities in the community, sports facilities on the site, running tracks or sports fields on the roof terraces.

Certain answers mentioned the following configurations: outdoor surfaces / panels / mounds / structures arranged for different motor possibilities, areas for intergenerational games, summer kitchen / outdoor zones with access to drinking water, climbing structures inside / on a façade / on the site, storage spaces for gardening tools / cold storage spaces. None of the respondents integrate into their design projects playful objects or interactive devices that convert kinetic energy into electrical energy.

4 Limitations of the Research

The first sample of this study had only 37 respondents in autumn, 2022 from students that had just began their 6th year of study in the Faculty of Architecture, UAUIM. These respondents offered valuable answers regarding their academic and extra-curricular experience in the field of sustainability and highlighted specific technical solutions implemented into their recent finalised architectural design studio projects from the second semester of the 5th year of study.

Our research team is currently expecting a second sample of answers from students that have just completed their exam session after their 5th year of study in the Faculty of Architecture, UAUIM. The survey is also open to students that have recently graduated and have just finalised their diploma project (after 6 years of study in the Faculty of Architecture or 5 years of study in the Faculty of Interior Architecture, UAUIM). This second sample may provide additional insights and help to strengthen the validity of our research.

Another potential limitation of this research is that it only includes students from one university and one specific program of study. Future research could expand and include students from other universities, faculties, and specializations in the field of built environment, to provide a more comprehensive understanding of the sustainable architectural design topic.

5 Preliminary Results

On a scale from 1 being „very small" and 5 being „very consistent", 57% of the students evaluated their personal sustainable design knowledge as „medium".

Approximately 40% of the respondents declared they attended one or more of the following 4 optional disciplines in their 4th year of studies: *Technological Products and Subassemblies in Contemporary Architecture, Modern Technologies for Structural Interventions on Existing Buildings, Technology for Sustainable Habitat* and *Contemporary Materials*. Only 7 students attended *Metal and Glass in Architecture*, and 5 students did not attend any of the above disciplines. One student checked „I do not know".

Almost 40% of the students attended one or more of the following 3 optional disciplines in the 5th year: *Rehabilitation of Built Stock; Current Trends in Structural Design; Building Equipment (2) – Renewable Energy* and *Sustainable Technology*. One third of the respondents attended *Architectural Eco-Technology* – course and technical project. However, 16% of the respondents did not attend any of the above disciplines.

Regarding the subjects in which students consider that they have acquired relevant knowledge, within the curricular activities completed so far in UAUIM, more than half of the respondents have chosen the following 7 topics: *acoustic comfort; natural lighting solutions; energy production from renewable sources; reducing energy consumption; solutions to ensure minimum sunshine norms; selective sun protection solutions; accessibility and inclusivity*. The least frequently chosen 5 subjects were: *biodiversity conservation and promotion*; *minimizing soil pollution*; *consulting activities on the maintenance of spaces and equipment*; *minimizing light pollution* and *air pollution*.

Students were asked to mention at least one curricular activity definitory for their acquired competences in the field of sustainability (course / seminar / practical application / workshop / technical or specialised project). Some students mentioned other sources of learning such as an Erasmus mobility, visits to firms or institutes, or listening to guest speakers. Even if

they have participated in the above mentioned various curricular activities related to sustainability, some of the students felt that they were not coherent, comprehensive, or integrated enough in their projects.

The following question required for relevant topics on sustainable design that were missing or insufficiently developed during academic studies. There was no clear consensus among the respondents, indicating a high diversity of interests and opinions among the students.

43% of the students declared they have participated in extra-curricular activities during their years of study. The various types of activities included workshops, international competitions, courses, summer schools, volunteering, conferences, and online learning. The in-depth subjects ranged from technical aspects of sustainable design (such as bioclimatic analysis, energy efficiency, renewable energy, green BIM) to ecological and social aspects (such as biodiversity conservation, waste management, accessibility, and inclusion).

The most frequently chosen components related to sustainable design that students think should have had a higher weight in the 5th year of study at the Faculty of Architecture were, in a descending order: *energy efficiency; Indoor Environmental Quality; users health and wellbeing; energy production from renewable sources; sustainable building management; sustainable construction site management*. The least frequently chosen components were *consulting activities on the maintenance of spaces and equipment, sustainable transportation,* and *circular economy*.

Figure 1 shows that 78,4% of students believe that sustainable design principles can and should be applied to any type of architecture program, regardless of its function, scale, or context. This result challenges the hypothesis that some architectural programs are more suitable or compatible with sustainable design principles than others. It also invites further exploration of how sustainable principles can be integrated into various architectural programs in creative and innovative ways.

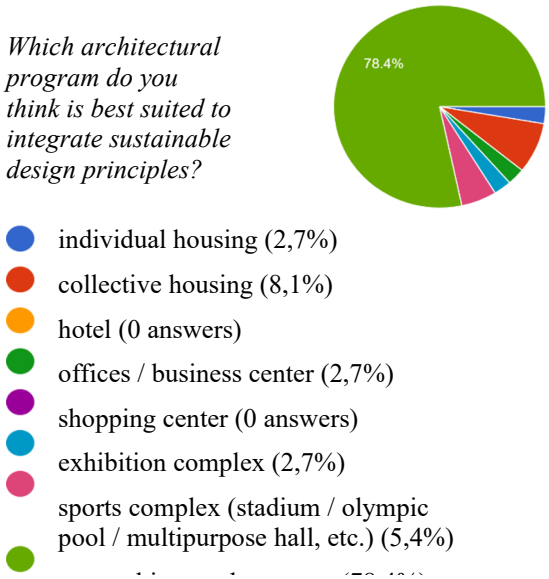


Fig. 1. Students' answers for integrating sustainable design principles in various architectural programs.

Figure 2 illustrates a large percent (70% of the students) agreeing with the opinion that discussions related to costs (associated with design, execution, use and post-use) during an architecture project developed in faculty are useful for the evolution of the project and even generate new solutions in project.

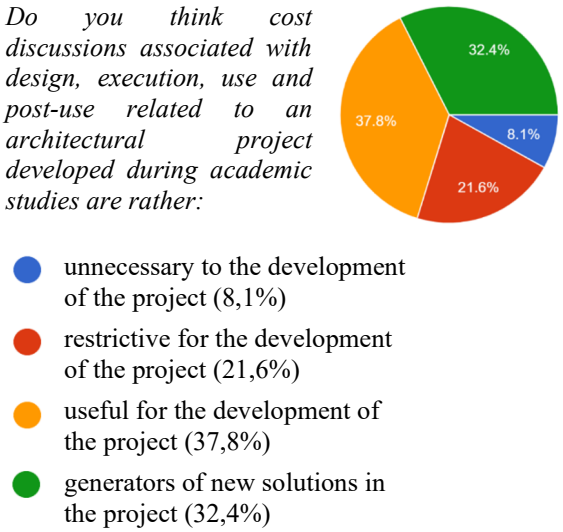


Fig. 2. Students' answers regarding cost discussions in a school architectural project.

The results illustrated in Figure 3 indicate that 81% of the students believe that the requirement to use free analysis tools (spreadsheets and software, i.e.: Athena Impact Estimator for Buildings / DIALux / Climate Consultant / Ubakus) for analysing specific sustainable components during a school project are useful for its evolution or can generate new design solutions.

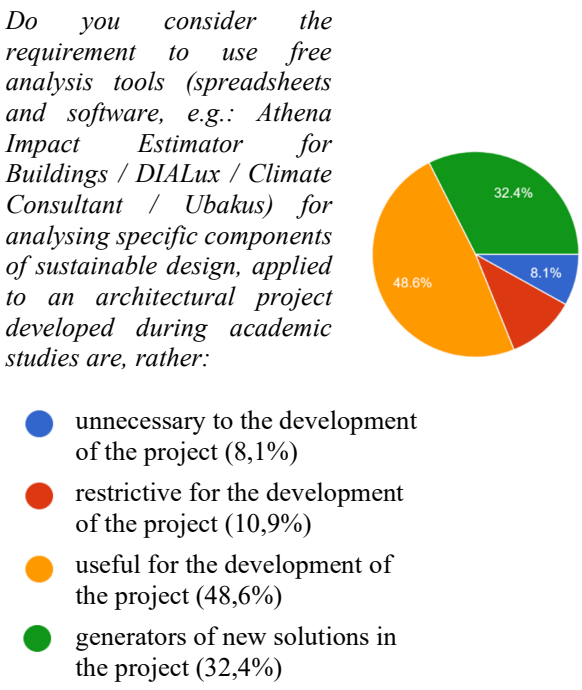
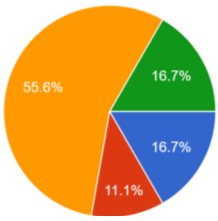


Fig. 3. Students' answers about mandatory use of free analysis tools in the specialised projects on sustainable design topics.

More than a half of the respondents prefer working in teams of two students when dealing with complex architectural design projects in the 5th year of study, as Figure 4 clearly illustrates.

Do you consider team work for a complex 5th year project on sustainable architectural design to be rather:



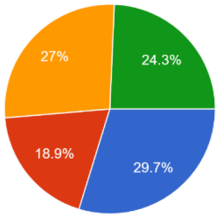
- difficult yet beneficial (16,7%)
- difficult and without clear benefits (11,1%)
- easier in teams of 2 students (55,6%)
- easier in teams of 4 – 5 students (16,7%)

Fig. 4. Students' answers related to preferred ways of working in a 5th year complex school project.

On a scale from 1 to 7 (1 meaning „completely irrelevant" and 7 „extremely relevant") a significant part of the respondents (73,3%) approved that specific examples of the type provided in the questionnaire are very and extremely relevant for their future diploma projects. None of the students ticked the „completely irrelevant" or „very irrelevant" options.

In regards of future personal training directions in the field of sustainability, 40,5% of the students were interested in obtaining certificates / specializations, 29,7% declared they would follow LEED / BREEAM / Passive House training courses and 27% answered they intend to work in an entity active in the field of sustainable architectural design. Only a few students intend to work in an entity active in the field of monitoring / certification of sustainable buildings or would like to follow master studies, doctoral studies or in-depth research in the field of sustainability. A significant percent of 37,8% of the students ticked the option "I don't know / It's too early for me to make a decision in this direction" and one student wrote that in the future would do "nothing related to architecture".

With which of the statements below do you rather agree, regarding the construction market in Romania?



- designers – architects and engineers set the direction in the field of sustainability (29,7%)
- customers set the direction in the field of sustainability (18,9%)
- manufacturers of construction materials, installations and equipment set the direction in the field of sustainability (27%)
- the central and local public administration sets the direction in the field of sustainability (24,3%)

Fig. 5. Students' opinions on sustainable design leadership.

It is quite interesting to compare the results shown in Figure 5 to the answers given by RIBA registered architects to the same question in 2020 and 2021.

In 2021 the RIBA study [18] found that 21% of the 613 respondents believe that clients are "leading the way on sustainability," while only 10% believe contractors are. Most of the polled architects (60%) declared that "design consultants, such as architects, are leading the way" on sustainability. The RIBA survey from autumn 2019 published in 2020 [19] acquired 906 responses for a questionnaire including the same question. The architects' opinions were bolded: 59% of the respondents saw "design consultants, such as architects, as leading the way on sustainability", while 14% perceived clients as trend setters and 3% said contractors are "leading the way". None of the British surveys included the option of "central and local public administration", which gathered almost a quarter of the UAUIM students' opinions.

6 Discussions

The findings from the "Sustainability in Architectural Design Approach" survey can be effectively applied to our research topic. A large majority of the respondents highlighted the need for in-depth understanding of sustainable ground rules from the first three years of school, to grow a transdisciplinary mindset towards sustainable architecture.

The survey results show a diverse and rich experience of extra-curricular activities related to sustainability and a high interest and motivation for learning and applying sustainability concepts and practices. 43% of the respondents declared they have participated in extra-curricular activities during their years of study. Some respondents have participated in international or interdisciplinary events or programs that exposed them to different perspectives and contexts.

A thorough study of contemporary architectural education systems [20-23] corroborated with the results obtained in the CHEIA T survey highlighted a synthesis of 10 weaknesses and gaps related to sustainability integration in the architectural design processes:

- the lack of coherence and depth in the sustainability topics taught or applied in some disciplines and dissatisfaction related to the quality and relevance of the presented sustainable ideas and technologies;
- the lack of real integration of sustainable principles on the architectural design studio projects, that focus primarily on functionality, form, volumetry, aesthetics and urban requirements;
- the need for more practical examples, case studies, construction sites and occupied sustainable buildings;
- the need for national sustainable built references instead of examples from other countries with different climatic and material conditions;
- the lack of collaboration between the architectural design studio teachers and the technical project teachers regarding the sustainability concepts;
- technical projects are seen as a secondary or optional part of the architectural design exercise, rather than an essential one;
- a lot of students do not appreciate or understand the value and importance of the historical or traditional aspects of sustainability;
- some answers reflect a lack of alignment and integration between the faculty's curriculum and the student's expectations and interests;
- the gap between academic approaches and NGO's or other professional entities approaches regarding sustainable design teaching and learning;
- not questioning / quantifying / meeting students' expectations and experience.

When referring to results of a questionnaire addressed to students in their final school years, the research should be aware of the subjective side (sometimes superficial or deliberately critical towards formal education without viable arguments).

Apart from this perspective, we should extract objective meanings from the survey's results. For example, answers that favour extra-curricular activities instead of mandatory academic ones can also show that some students have taken initiative and responsibility for their own learning and development.

7 Recommendations & Conclusions

The outcomes of the CHEIA T research can be used as a leverage for planning a consistent academic curriculum [1, 10, 23, 25] that covers both theoretical and practical aspects of sustainability in a comprehensive manner.

Following this key goal, our paper outlines 30 recommended measures for grounding architectural education on the four pillars of sustainability: environmental, social, economic and cultural:

- *promote* cross-disciplinary and project-based approaches that involves collaboration;
- *develop* networks of entities interested in organizing practical activities focusing sustainable design in support of architectural education;
- *establish* partnerships with relevant stakeholders;
- *collaborate* with NGO's involved in sustainable design education and practice;
- *attract* guest speakers, practitioners and experts to share their knowledge, experience and insights;
- *support* students to participate in extra-curricular learning opportunities;
- *invite* NGO's representatives to share their expertise and experience with the students and teachers;
- *organize* field trips and site visits to observe real-world examples of sustainable construction;
- *create* platforms for students to share their learning outcomes and reflections with peers and teachers;
- *integrate* these experiences into the assessment and evaluation of the students' performance and progress;
- *require* feedback from students on a regular basis;
- *use* feedback to improve the quality and relevance of the courses, projects and practical applications;
- *provide* clear and constructive guidance and feedback to the students throughout the courses or projects;
- *test* new elective courses or workshops that focus on the 10 key sustainability topics;
- *incorporate* these topics into the core courses or projects, highlighting their importance and applicability in different contexts;
- *facilitate* access to resources and information, such as books, journals, websites and databases.
- *analyse* built examples of regional and local sustainable architecture;
- *foster* collaboration between teachers from architectural design studio and teachers from technical projects, in order to align objectives, expectations, and feedback for students;
- *co-teach* sessions and *co-evaluate* some assignments, to demonstrate mutual respect and support;
- *find* methods to link technical projects to the architectural design studio projects in a meaningful and coherent way for the students, rather than as a separate or additional task;
- *work* with tools and software that can help students and teachers to evaluate and improve their design performance in terms of sustainability criteria;
- *update* and *diversify* the content and sources of information presented, so that students can learn about the current and emerging ideas and technologies in sustainability;
- *explain* and *demonstrate* to students the relevance and applicability of the social and educational dimension in current contexts and situations (a specific example: "post-socialist cultural landscape of urban space in Central and Eastern Europe") [24];
- *balance* and *contrast* presentations of the old and new ideas and technologies, so that students can see their strengths and weaknesses, their advantages and disadvantages, and their similarities and differences;
- *encourage* students to critically evaluate and compare different ideas and technologies, rather than uncritically accepting or prematurely dismissing;

- *challenge* students to come with their own ideas based on their creativity and research;
- *ask* for feedback from students on what they have learned from their extra-curricular activities and how they applied it into their projects; use this valuable feedback to improve curriculum and methods;
- *offer* students chances to participate in competitions and *propose* innovative and context-sensitive solutions for sustainable design and construction;
- *conduct* research on sustainable architecture;
- *promote* results through exhibitions and publications.

Changing circumstances of the building industry influenced by the evolving norms and standards concerning sustainable development need to consequently readjust the relevant content and methods applied in education for the built environment.

Students value practical application of the sustainability concepts more than theoretical ones and expect to learn about the latest and most innovative trends and solutions.

Faculties of architecture should therefore provide more opportunities and resources for the students to apply sustainable architectural design in a context-specific manner.

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