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VALUATION OF ECO-DESIGN WITHIN THE PROFESSIONALIZATION OF STUDENTS-ARCHITECTS AND DESIGNERS

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Abstract – The article presents a theoretical-practical study that succinctly exposes and analyzes some researchers' views in the targeted field, reflecting the importance and possibilities of contemporary university education for sustainability. It specifies state policies for promoting a healthy and safe environment and proposes pedagogical strategies for enhancing environmental education or ecological and sustainability education for architecture and design students. Additionally, it presents educational activities carried out in both formal and non-formal contexts, contributing to the development of scientific and professional thinking of architecture and design students, fostering respect for environmental protection through concept projects aimed at reducing excessive human consumerism. Furthermore, it highlights the role of ecological education in developing creativity, aesthetic taste, moral qualities, and the affective-emotional sphere in the process of planning and executing planned actions. The influence of teaching and educational experience on the selection of recycled materials used for creating furniture and lighting fixtures is elucidated; in the research and presentation of these within theoretical-practical seminars. Recommendations are offered to optimize the ecological education of architecture and design students to achieve ecological literacy among future specialists who will develop sustainable and durable works. The students' creations vary in composition, form, size, color range, and functionality.

Keywords – sustainability, eco design, recycled materials

I. INTRODUCTION

In the context of global transformations in geographical, cultural, economic, political, technological, and educational aspects, universities develop mechanisms to optimize the educational process by signing, conducting, and maintaining partnerships at national and international levels focused on the high-quality initial training of future specialists. Educational reforms in higher education, promoted by European Policies, primarily focus on the student, granting them the role of partner to the teaching staff in the

development and application of new teaching and learning methods and techniques. Thus, the quality of the instructional-educational process in universities must be approached from the perspective of sustainability, which can be related to the concept of sustainable development [1] that operates with a set of new notions such as: *co-design, co-decision, co-implementation* (*co-teaching or co-production*), and *co-evaluation* [2] and involves the creative participation of all actors engaged in these educational activities, being valorized in the context of the principle of inter-, pluri-, and transdisciplinarity. Based on the aforementioned and in correlation with the general function of sustainability, which aims for the balanced and sustainable social development of the planet, its population, and economic production, achieved through the economical consumption of natural, human, and social resources, existing or available in space and time [1] the need for rethinking and reorganizing curricular and extracurricular activities in universities becomes apparent, offering students opportunities to personally contribute through the development and implementation of effective projects in promoting a healthy and safe environment—a goal supported by the state policies of our country [3] and the educational system of the Republic of Moldova, which has aligned itself with the Sustainable Development Goals (SDGs), particularly focusing on (*Quality education)* aimed at ensuring quality and inclusive education throughout life [4].

Thus, aiming to optimize the education process for high-quality vocational training aligned with European standards, and to support and maintain a healthy and safe environment, several higher education institutions in our country advocate and promote ecological values, among them being the Technical University of Moldova (TUM).

Alongside educational institutions and economic agents, they advocate for a healthy and safe environment through the creation of both ecological products and eco-design or sustainable design, which represents an approach to the design process aimed at reducing the negative impact on the environment throughout the product's lifecycle (from concept and design, through production, use, and ultimately disposal or recycling). In contemporary times, eco-design represents a crucial direction in the development of modern products, aligning with global sustainability goals and environmental protection efforts.

Given that currently, the environmental state is precarious due to multiple factors negatively influencing this phenomenon, environmental aspects addressed, described, and regulated in national, regional, and international sustainable development projects are becoming increasingly complex. The focus is placed on sustainability education, encompassing three main directions: economy, society, and the environmen [5] and involves the formation/development of the student's competence for efficient lifelong learning and self-learning, achieved through optimal utilization of theoretical and practical knowledge acquired over time. Researcher E.D. Tiron argues that environmental education or ecological education should be oriented towards:

- awareness, understanding, and immediate prevention of the risk of destruction to nature and the human species;
- identification, development, and application of effective means and methods for environmental protection at geographical, biological, and human levels;
- development and efficient implementation of coherent strategies for environmental protection at all levels and grades of education [6].

The objectives of environmental education or ecological education include:

- developing responsible attitudes towards nature;
- correctly defining concepts such as ecological education, ecological literacy, ecological culture, etc.;
- mastering a coherent system of knowledge about the lithosphere, biosphere, living organisms;
- understanding the relationships between humans and nature in the context of ecosystem balance and interdependencies, between living organisms and the environment, in understanding nature conservation and forming a unified scientific view of the world and life;
- fostering attitudes of responsibility for the defense and protection of natural heritage, for the rational management of the planet's resources, for its hygiene;
- collaborating on ecological issues in science and technology for the protection of the environment [7].

Therefore, environmental education/ecological education and sustainability imply the implementation of a set of actions aimed at informing and culturally educating individuals about ecology. This is based on mastering knowledge, explanations, internalizing attitudes, and fostering responsible behaviors towards the environment. The construction of this type of education occurs through the intersection of ecology with geography, biology, sociology, chemistry, etc. [8] moreover, through the intersection of ecology with architecture and interior design (industrial, fashion, interior, etc.), sustainability in architecture and interior design can be approached from multiple dimensions. These include architectural assemblies (buildings, structures, architectural elements, etc.) and interior objects (furniture, decorative items, lighting fixtures, etc.) made from ecological and durable materials.

Furthermore, through the intersection of ecology with architecture and design (industrial, fashion, interior, etc.), sustainability in architecture and interior design can be addressed across multiple dimensions. This includes architectural ensembles (buildings, constructions, architectural elements, etc.) and interior objects (furniture, decorative items, lighting fixtures, etc.) made from ecological and durable materials.

II. MATERIALS AND METHOD

The study of theoretical frameworks, discussions with ecologists, architects, designers, etc., has allowed us to establish that scientific research on promoting sustainability in the context of architecture and interior design (eco-design) has been conducted sequentially. This has prompted us to provide architecture and design students with opportunities for active involvement in conducting various investigations and educational activities in both formal and informal settings.

Therefore, students have come up with innovative proposals to address the investigated problem, which include a range of scientific research methods such as: *documentation, analysis of scientific sources, photography, case studies, modeling and simulation, comparison and interpretation of results*, aimed at achieving predetermined objectives.

III. RESULTS AND DISCUSSION

Given that environmental education/ecological education and sustainability must be implemented at all levels of education, including universities, we propose a set of pedagogical strategies to enhance environmental education and sustainability for architecture and design students:

- Strategy focused on respecting teaching principles continuously adjusted to context and curricular content.
- Strategy respecting the principle of interdisciplinarity in designing educational activities by integrating sustainability and sustainable development concepts within specific disciplines of architecture and design.
- Strategy using interactive methods and tools appropriate to the intended goals, encouraging students to participate in investigating the subject matter to propose sustainable and environmentally responsible architectural or design solutions.
- Strategy centered on leveraging architecture and design students as active actors and partners of educators in conducting educational activities through and for sustainability.
- Strategy creating a conducive and stimulating environment for conducting environmental education and ecological education for architecture and design students in the context of sustainable development through the establishment of spaces and laboratories dedicated to research and innovation in the use of sustainable materials and technologies.
- Strategy for monitoring and evaluating educational activities (using criteria and indicators to effectively assess sustainability in students' architecture and design projects) focused on important aspects of the specific disciplines taught, providing constructive and quality feedback with suggestions for optimizing architecture and design projects from a sustainability perspective.

To demonstrate the effectiveness of these pedagogical strategies in shaping a new generation of professionals prepared to address ecological challenges and promote sustainable development in their practices, we will present and analyze several encouraging results achieved by architecture and design

students within the Postdoctoral Research Project 2021-2023, numbered 1.00208.8007.11/PD, directed by Dr. Angela Munteanu, Associate Professor, Technical University of Moldova. These results are reflected in the works of the Scientific-Practical Seminar "Eco-Friendly Creations" [9]. The Scientific-Practical Seminar "Eco-Friendly Creations" spans over 6 years, bringing together students and professors who share the same ideas and visions regarding the promotion of sustainability in architecture and design (eco-design). It showcases various innovative real-life projects and works such as furniture pieces, lighting fixtures, decorative objects, etc., renovated or revitalized and created from recycled materials, developed in both formal and non-formal contexts, as depicted in Figure 1.

Figure 1. Sustainable desk lamp, author Victor Gușanu, student, group ARH-181, TUM [9].

This work represents a desk lamp, designed and crafted from wood, concrete, and glass, adhering to ecological principles such as energy efficiency, use of eco-friendly materials, and product durability. It features simple geometric forms (cube, cone, sphere, cylinder, or pyramid) arranged aesthetically, suitable for a wide range of minimalist interior styles.
Similarly, students have developed impressive works used as desk lamps, based on sustainability principles and employing the reuse method, utilizing vintage telephone parts, plastic pipes, metal tubes, wood scraps, and concrete, as depicted in Figure 2.

Figure 2. Sustainable lighting fixtures [10].

Another creation executed by student Mariana Rusu, group ARH-181, inspired by the artwork "Column of Infinity" by the great sculptor Constantin Brancusi, combines Romanian traditions with modern art. It is crafted with simple and elegant forms successfully translated into a lighting fixture, based on the concept of spiral and sustainability principles, Figure 3.

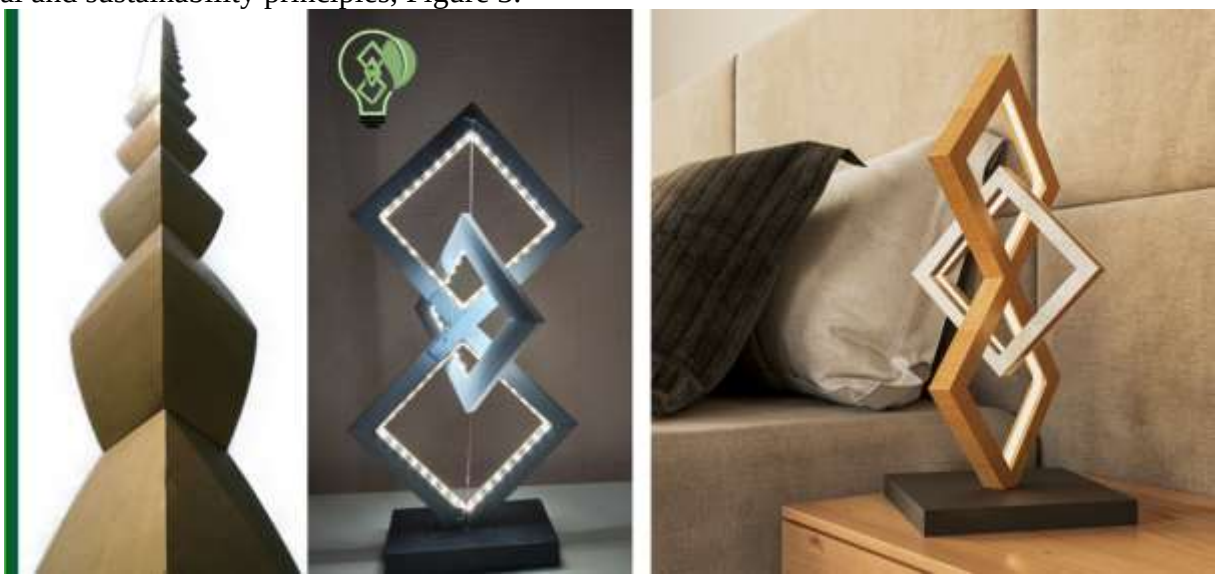

Figure 3. "Column of Infinity" lighting fixture, author Mariana Rusu, student of group ARH-181, TUM [9].

From the above, we can conclude that one dimension of sustainability reflected in furniture design involves the use of recycled materials and adopting eco-friendly practices to create durable pieces with an ecological impact on the environment. Therefore, by integrating regenerative materials into eco-friendly production techniques, specialists can produce furniture that combines functionality and aesthetics with the conservation of natural resources and the reduction of pollution, promoting efficient and responsible use of natural resources.

In this context, it is necessary to emphasize that an essential contribution to promoting ecological values and sustainable practices is made by disciplines such as Interior Space Architecture I, II, Eco Design, Creativity, and Innovation in Architecture and Design, included in the curriculum of the Technical University of Moldova. The head of these units is Angela Munteanu, PhD, Associate Professor, Department of Architecture.

To achieve effective ecological education for architecture and design students, we propose the following recommendations:

1. Organizing work in multidisciplinary teams that include architects, designers, ecologists, and sociologists to address current issues from diverse perspectives.
2. Conducting practical workshops where students can experiment with eco-friendly materials and sustainable construction and design techniques.
3. Developing online platforms and educational resources that provide access to updated information and case studies.
4. Hosting periodic workshops and seminars on current topics in ecology, architecture, design, and sustainable development.
5. Encouraging students to participate in research projects exploring innovative and sustainable solutions applied in architecture and design.
6. Supporting participation in conferences and the publication of research results in specialized journals.

IV. CONCLUSION

In conclusion, we emphasize that environmental education/ecological education for architecture and design students, aimed at promoting sustainability, is highly necessary and beneficial in contemporary society. As technology advances across various social, cultural, and economic dimensions, there is an increasing impact on the environment. Educational actions conducted within formal and non-formal contexts at the university level, supported by the initiation and implementation of effective partnerships with institutions and experts from diverse fields, can positively influence the ecological awareness of students. This encourages them to engage in sustainable architecture and design projects.

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