Sustainable architecture through an environmental educational program

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ABSTRACT

The following paper is a presentation of an environmental program titled "Considering the house of the past, I plan the house of today". The program examines the basic environmental principles of the traditional Greek house which can be applied to new houses -bioclimatic- , covering the needs of modern lifestyle. Is a proposal to raise the student community in the spirit of sustainable development, through an experiential education that uses alternative methods and techniques to make the learning process more efficient and attractive at the same time.

This program is consistent with the general philosophy of the new curriculum of the teaching learning field for environmental education and sustainable development. Resulted from the need to create a different educational framework with innovative aspects and answers to everyday problems. It covers the needs of today's society, emphasizes in student-centered teaching and team cooperation, in active construction of knowledge through selected information sources and specific teaching strategies. Students learn how to learn, learn how to act, learn how to live and interact with others.

The main goals as specified in the Expected Learning Outcomes are cognitive, based value and interactive and focused on information, awareness, decision-making and participation in solving the environmental issue / problem.

Regarding the evaluation, the data assessed is the composition and presentation of the students work and the achieving of the goals through observation, discussion and questionnaire.

1. INTRODUCTION

Is true that the energy crisis has created serious concern about the lack of energy resources and their impact on the global economy as well as it has become awareness that a very high proportion of primary energy consumption caused by the operation of systems related to heating, cooling and lighting of buildings so as to contribute to environmental pollution and energy problem. Therefore, it is imperative requirement, saving energy and exploitation of alternative sources of energy to become key objectives in buildings design. [1]

The contemporary bioclimatic architecture comes as a response to the above findings and raises again the goal of human life in harmony with the natural environment. [2]

Realizing that we must built with the environment in mind, it is useful to know how the traditional architecture has been integrated into the ecosystem and the manner in which the principles which govern it can be used creatively as steering axles in modern passive solar Architecture.

Nowadays, Education for Sustainable Development, according to official texts of UNECE (United Nations Economic Commission for Europe), UNESCO (United Nations Educational, Scientific and Cultural Organization) and UNEP (United Nations Environment Program) constitutes undeniable proposal to ensure prosperity on Earth by protecting the environment and ensuring quality of life. Requires the redefinition of needs of the individual both in personal and collective level and, therefore the revision of the value system that we have adopted so far as individuals and as societies.

The implementation of the project plan by the students include [3]:

- Teamwork exploratory approach
- Processes of problem solving, as a general teaching strategy in individual groups of 3-5 members.
- Selection of specific teaching strategies / techniques
- Identifying and investigating environmental issues and problems
  Instructions for searching, collecting, organizing and processing data
- Drawing conclusions
  Composition and notifying of results

The program can be adapted for all levels of education.

2. INTENDED LEARNING OUTCOMES BY STUDENTS

Level 1: Basic knowledge

- To recognize that the traditional architecture created within the constraints and opportunities of each region, as a result of human thought, experience and observation of the natural environment.
- To report elements that define the structure of settlements and the morphology of buildings in traditional architecture: climate, topography, orientation, view and of course the social and economic. [4]
- To be informed that the structure of settlements is also driven by local climatic conditions and that the materials derived from the immediate physical environment.
- To recognize that environmental construction of energy efficient buildings is imperative requirement front of the environmental crisis intensified constantly. [5]
- Finally, recognize that every period should produce different architectural styles of bioclimatic buildings, depending on the particular physical assets, technology and the given culture.

Level 2: Identify the problem / issue

- To look for the ways that the traditional house achieves best comfort conditions indoors by adapting the construction to local climatic conditions.
- To consider why the materials in traditional houses come from the immediate environment. [6]
- To compare the current method of construction of buildings and identify potential weaknesses in the way of construction.

Level 3: Investigation of problem / issue

- To investigate which are the basic environmental principles governing the traditional house.
- To investigate how these principles can be applied to new bioclimatic houses covering the needs of modern lifestyles.
- To propose new ways of alternative housing.
- To encourage the adoption of new methods of environmental - bioclimatic design and construction for energy efficient buildings.

4th Level: Actions

- To design on paper the house in which they wish to live by giving them guidelines for solutions aimed at reducing ecological footprint.
- To comment and to express publicly the advantages and disadvantages of bioclimatic design.
- To construct the model of an energy-passive solar house in which they would like to live by using creatively materials scale model.
- To impersonate roles from different professional and social groups which participate in the design of the built environment.
- To work in groups, to develop relationships, to communicate, to reflect and to be entertained.

3. PROGRAM COURSE

First day

3.1. Topic

Meeting, acquaintance, familiarity.

- EDUCATIONAL TECHNIQUES

Acquaintance games. Games aimed to develop a friendly and cooperative atmosphere while enhancing self-esteem, self-aggrandizement, the skills of observation and listening, interaction with others, cooperation and conflict resolution. Simultaneously cultivated the acquaintance of another, the expression and sharing feelings, the altruistic behavior. [7]

- EDUCATIONAL MEDIA

Cd player, cd, ball.

- DURATION

morning 08.30 to 09.00

3.2. Topic

Separation of the environmental group into subgroups of 4-5 individuals.

- EDUCATIONAL TECHNIQUES

1 Division into teams by playing games.

2 Playing games for teams cooperation and coordination.

The indicated organization form of the class for the implementation of the program is the group cooperation. Students work in subgroups. They participate actively, communicate, express themselves freely, support each other and so strong team spirit is cultivated. The

experience of cooperation is necessary for the student to develop critical thinking (thinking upper field) event greater significance than simply teaching and learning facts and theories.

3 Establishing a "learning contract team."
The learning contract is a set of rules and assumptions, which are consistent both the animator and students in order to reach the target group. Is created such as to laid the foundations for the team while simultaneously distinguishes it from the others. Finding acceptable terms and then the observance of all, is the most basic function of contract learning in a group (Moon, passim).
• EDUCATIONAL MEDIA
Cd player, cd, ball.
• DURATION
morning 08.30 to 09.00

3.3. Topic

Examination of the theme 'traditional settlements – manners of the structure of the traditional house'
EDUCATIONAL TECHNIQUES

1 Brainstorming. We record the views and experiences of children and groups them. The brainstorming technique is used when we need to make multifaceted examination of an issue and to develop as many ideas around it. Is a participative process during which students are encouraged to express freely and spontaneously their views on the topic and to share their ideas with the group even if they look funny, improbable or unrealized. The first step is recording the answers, without comment as at this point any comment, positive or negative, can prevent the "storm" and block the process. But when the “storm” has been completed, all participants are asked to explain their views. So becomes composition and processing of the results of the findings in plenary. [8].

2 Lecture with active listening by students.
EDUCATIONAL MEDIA
Table, paper, markers, computer, PowerPoint.\
DURATION
morning 09.30 to 10.00
10.00 – 10.15 break

3.4. Topic

Visiting the traditional settlement
EDUCATIONAL TECHNIQUES

1 Study in the field. [9]

2 Game of the hidden treasure.
Before visiting the pedagogical team has managed to talk with residents in the settlement who know and can provide information, has found houses for the typical study and has "hide" in easily visible places folders with rich information and photographs for the teams. A worksheet is shared in each team. Each worksheet contains a map or puzzles that instruct students in appropriate houses, shops and people to gather information. Also, each sheet includes activities should make after observing the housing and settlement. Students wander in the village, collecting information, looking folders, observe, record to complete the information requested on the worksheet:

-Items for which the specific location was chosen to build the settlement.
-Details of the organization of traditional housing in relation to the natural environment and climatic conditions.
-Information relating to natural building materials of traditional house.
Students note the routes, the most typical houses, the center of the village, the water sources etc. on a map. Also they interview residents of the village and collect photos.
EDUCATIONAL MEDIA
Map, compass, worksheets, folders with information.
DURATION
Morning 10.15 to 13.00

3.5. Topic

Findings.

- EDUCATIONAL TECHNIQUES

Team activation game.
Presentation by groups of the information collected during the visit to the village (Map, worksheets, photographs, sketches).

- EDUCATIONAL MEDIA

H / H, PowerPoint, stater photos.

- DURATION

Afternoon 17.30 to 18.45
18.45 to 19.00 Break

3.6. Topic

Integration – Conclusions

- EDUCATIONAL TECHNIQUES

Brainstorming
Considering the sustainability principles that emerge from the observations preceding and which govern the organization and structure of traditional houses. Discussion - Reflection - informing.
Brainstorming. Examinating how these principles can be integrated to the creation of a house that meets the needs of the modern lifestyle without burdening the environment. Discussion - Reflection - information. Integration - conclusions.

- EDUCATIONAL MEDIA

Table, paper. markers.

- DURATION

afternoon 19.00 to 19.30
Second day

3.7. Topic

Coordination - activating teams.

- EDUCATIONAL TECHNIQUES

Coordination and activating teams with games.

- EDUCATIONAL MEDIA

Tabs, Cd player, cd,

- DURATION

morning 08.30 to 09.00

3.8. Topic

Examined issues "principles of bioclimatic design - passive solar house."

- EDUCATIONAL TECHNIQUES

1 Lecture

2 Worksheet

Speech on "principles of bioclimatic design - passive solar house." A worksheet is distributed to students which must be completed during the recommendation. Contains an acronym relevant to the subject matter.

- EDUCATIONAL MEDIA

Computer, PowerPoint, worksheets.

- DURATION

morning 09.00 to 09.30

3.9. Topic

Creation of "moral dilemma" for the use of the principles of bioclimatic design.

- EDUCATIONAL TECHNIQUES

Case studies, role playing, moral dilemma, runway consciousness. [8]

A worksheet that includes an article is shared to students. The article mentions an imaginary problem case. For example, in a traditional village, the state is going to demolish a well-preserved traditional public building and in its place to build a new modern building which does not meet the principles of bioclimatic design. In the municipal council there are conflicting views ..... Students are asked to act out roles supporting these different views. All students go through all roles. After the role play, is discussed the moral dilemma: "Yes or no to the above situation," the decision is taken by the technique of the runway consciousness.

- EDUCATIONAL MEDIA

Worksheets

- DURATION

morning 09.30 to 09.50

3.10. Topic

Creation of a passive solar house concept plan.

- EDUCATIONAL TECHNIQUES

Case study.

Design - visual and artistic expression by the technique of collage and the use of different materials for the color rendition of the subject - a modern-energy passive solar house, giving guidelines and instructions for the proper organization and formation of the interior, according to the conclusions that preceded it.

- EDUCATIONAL MEDIA

Paper, cardboard, markers, pencils, pastel colors, glues, scissors and others.

- DURATION

morning 09.50 to 10.50

3.11. Topic

Findings.

- EDUCATIONAL TECHNIQUES

Presentation of the teams work

- EDUCATIONAL MEDIA

Stater projects.

- DURATION

morning 10.50 to 11.20
11.20 to 11.35 Break

3.12. Topic

Creating model of a passive solar house.

- EDUCATIONAL TECHNIQUES

Laboratory construction - montage of the model of a passive solar house, providing them with materials suitable for the simulation of the structural elements and especially those that are the main systems-techniques for the exploitation of the natural energy sources and other environmental parameters. A ground plan of the house in scale 1: 20 is given as background, and also simulated parts of the structure and elements of the natural environment.

- EDUCATIONAL MEDIA

Ground plan of the house in scale 1: 20, simulated parts of the structure, simulated elements of the natural environment.

- DURATION

morning 11.35 to 12.15

3.13. Topic

Integration

- EDUCATIONAL TECHNIQUES

Presentation of the construction of the model

- DURATION

morning 12.15 to 12.30

3.14. Topic

Program evaluation [10]

- EDUCATIONAL TECHNIQUES

With game (True - False), taking into account the cognitive, affective and psychomotor cultured background during the program implementation.
Also the data evaluated are the composition and presentation of the team work and the way that the goals have been achieved through observation, discussion and questionnaire.

- EDUCATIONAL MEDIA

A form containing 10 proposals right or wrong.

- DURATION

morning 12.30 to 13.00

4. WAYS FOR AN EXTENDED APPLICATION OF THE PROGRAM TO AREAS/OBJECTS OF SCHOOL

Considering the above and the need for changes in the way of the current education so this can meet the challenges of the times, this program is linked to the new curricula Compulsory Education, drafted as part of the implementation of the Act "NEW SCHOOL (School of the 21st Century). "More specifically, it is connected with the didactic learning field: Environment and

Education for Sustainable Development, and is part of the theme: sustainable housing. At the same time it can be extended and applied to the following topics of the curriculum of the Elementary and High school:

1. Cultural heritage – monuments
2. Buildings and heritage sites
3. Traditional villages
4. Environment and health-risk and appropriateness of materials and structures
5. Sustainable Architecture - Bioclimatic passive systems - Microclimate - Ventilation, lighting, cooling - Orientation - Natural and artificial ways to improve thermal comfort
6. Environment and energy issues
7. Conventional and renewable sources of energy-saving. Eco-footprint energy at home and at school

Furthermore, the following table is an attempt to link the framework for the organization of action with course content, as defined by the curricula of secondary education. For this reason, we matched courses in Physics and Biology, with topics referred to in organizing the operation and management of a passive solar house. These thematic sections could be suggested topics for developing of the research work in the A and B class of the Lyceum.

Table 1

PHYSICS - General Lyceums	**BIOCLIMATIC DESIGN topics**
CAPITALS	
Total energy conservation and energy degradation	energy planning
Indoor air energy-Weather	Indoor Air Quality
Kinetic theory of gases-gas specific heat	Aeolic chimney -solar chimney - cross ventilation
Thermodynamics Thermodynamic heat Laws	Passive solar systems Energetic solar systems
Thermal machines Carnot's Engine	Solar Energy Systems
The Light	Natural Daylight and Windows
Wavelength and frequency light against the spread: Reflection and refraction of light.	Day lighting systems Sunscreen systems "Cool Roofs" Lining Design and Selection of Position Reduction of 'heat island'
Dissipation and prisms	Systems for Light changing direction
Photocells or photovoltaic	RE: Photovoltaics
Sound waves Reflection of sound Contribution sound waves Reinforcement-extinction	Noise reduction Acoustics Acoustic fences
BIOLOGY - General Lyceums	
CAPITALS	
Man and Health Homeostasis	Indoor environmental quality
Human functioning thermoregulatory homeostatic mechanism	Function control mechanism - Indoor thermal comfort Temperature and humidity sensors
Man and Environment Ecosystem-Biotic and Abiotic factors	Selection and Design of position Protecting existing environment Management of the Landscape
The water cycle	Reducing runoff storm water. Reducing the use of potable water for landscape management
Pollution	Energy Design-RES

5. CONCLUSIONS

Each experiential activity of this program has to be framed by a process of critical reflection. After each activity, and is absolutely necessary, students must have the time and the impetus to think about what they did, what difficulties faced, what they learned, how it is to use this learning, how they felt, how collaborated with others, what would might have done differently, etc. The identification and mobilization of thoughts, feelings and knowledge, help students organize their knowledge. Otherwise, the whole thing lacks orientation and is distinguished by vagueness and sloppiness that easily can lead students to disappointment and boredom.

Anyway, educational experience has shown that learning is best achieved when the learners themselves attain a balance of pure viewing, direction, high quality support and a true sense of achievement and growth. [11]

After all, respective to experiential learning programs, as designers we should ensure a balance between the creative part of the activity, i.e. the expression of the learner's and the cognitive part, i.e. the understanding of the surrounding world. Each experiential activity should not only be enjoyable and lively, but should also help students to exceed their personal experience and knowledge and also to construct a deep knowledge of reality that surrounds them. [12]

So we drew up this program, because we think it constitutes a very good effort to raise awareness of the student and the educational community and in general of the wider local community. That is why, we examined the traditional and the contemporary house in the light of sustainability, with a clear focus to the expected learning outcomes mentioned above.

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