



UGSEAD
Uluslararası Güzel Sanatlar Eğitimi Araştırmaları Dergisi
International Journal of Research in Fine Arts Education



<http://ugsead.penpublishing.net>

Art Education Regarding Design and Nature-Bringing Spatial and Functional Proposals to Some Cave Houses in Capadoccia Region, Turkey*

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Önerilen Atf: Yıldız, P. (2018). Art Education Regarding Design and Nature-Bringing Spatial and Functional Proposals to Some Cave Houses in Capadoccia Region, Turkey. *Uluslararası Güzel Sanatlar Eğitimi Araştırmaları Dergisi (UGSEAD)*, 1(1), 21-28.

Received: 20 December 2018
Accepted: 21 December 2018
Online Release: 30 December 2018

Keywords:

Special Talent Exam, Visual Art Education, Field Education, General Knowledge, Professional Knowledge

ABSTRACT

Art Education is based on variable approaches in a wide vision. Cultural, intellectual, aesthetical, technical, historical etc and many more parameters are subjects to be recognized. The rich and fruitful reflections are being delivered after the use of theoretical and practical work in education.

Historical approaches in design education regarding both theoretical and both analysis work forms the basis of art knowledge. But to assume the most effective practice should be depending on the structure of bringing proposals to historical subjects.

An approach to analysis work should be considered on the basis of architectural usage. Historical monuments could be evaluated by the interaction of parametric design facilities.

Use of computer based technologies in design issues is forming the standards and concept of design also. Parametric design is one of the reflections addressing design in relation with computer aided facilities. Some samples and basic approaches are being analyzed with proposals in design education.

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Giriş

In order to gain an understanding of what parametric design means it is helpful to look briefly at definitions of "parametric" and "design" independently.

"Parametric" is a derivative of "parameter" which itself originates from the greek para, meaning a subsidiary or beside and matron, as in to measure (OED, 2002). In mathematics a parameter is defined as 'a quantity constant in the case considered but varying in different cases'.

Mathematically a particular circle can be described with two equations where there is one parameter, the angle θ , and one constant the radius r : $x = r \cos \theta$ $y = r \sin \theta$

Simon (1996) describes a Science of Design as that which involves any process where a new artifact is created in order to solve some problem.

This definition is expanded by contrasting artificial (or design) sciences (those which are concerned with man-made artifacts) with the natural sciences (those concerned with developing knowledge of natural objects and phenomena).

* Bu çalışma, 2018 yılında Ankara'da gerçekleştirilen II. Uluslararası Sanat Eğitimi Araştırmaları Sempozyumu'nda sözlü bildiri olarak sunulmuştur.

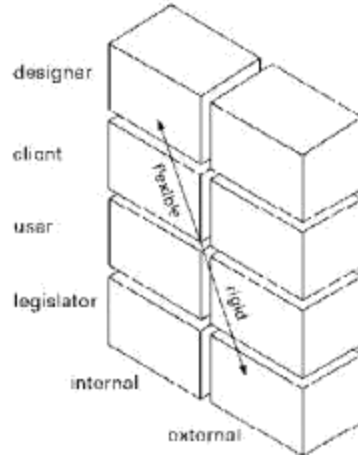


Fig. 1 The model of flexibility among all four effective groups of design. Design process as an interaction among problem and solution (Parsae M, Motealleh P, Parva M, 2015)

In this model design process is being identified multidimensional. The input and output of design paradigm is depending on many variables. Each are supportive to form the general structure.

Architectural Heritage Embedded in Design Education

Architectural heritage is a symbol reflecting the identity and cultural background of societies. Concerning the geographical position in addition to social and cultural relations, Turkey has too many historical heritages even from ancient periods especially on the basis of architecture. These architectural symbols are the signs of the first nature of societies located in these countries.

Cultural Heritage for Sustainable Purpose

Cultural heritage on the basis of architectural monuments are valuable indicators in problem solving methods in design education with practice work.

Analyzing Common historical buildings with environment, tradition, physical quantities etc. have to be analyzed by common functions in these buildings with optimal spatial qualities.

Strategies for parametric design in architecture

A new specialist design role is emerging in the construction industry. The primary task related to this role is focused on the control, development and sharing of geometric information with members of the design team in order to develop a design solution. Individuals engaged in this role can be described as parametric designers.

Parametric design involves the exploration of multiple solutions to architectural design problems using parametric models. It is anticipated that the emergence of parametric designers will spread and a deeper understanding of the role is required.

This work is aimed at establishing a detailed understanding of the tasks related to this new specialism and to develop a set of considerations that should be made when undertaking these tasks. It is proposed that a generalized understanding of applied parametric design is primarily developed through the study of practical experience. In order to gain an understanding of what parametric design means it is helpful to look briefly at definitions of "parametric" and "design" independently.

Cave houses

Learning parametrical design issues in education on the basis of sustaining cultural heritage. Using cultural heritage not only for vision perception but also for necessary usable functions.

- privileged archetypes of the concept residence being preserved from ancient periods until today.
- The formation of these structures,
- their aesthetic value as a whole,
- the environmental approaches,
- sustainability ability of these houses,
- interior space etc. are being identified.

The aim of this paper is to mention the historical background, formation and developments of the spatial necessities of human from the ancient times that have been surviving from thousands of years and are still in the function today. The functions of these cave houses in current conditions are also being evaluated and the proposals are indicated.

Location

Cappadocia, also known as the region of Göreme is situated in Central Anatolia. The site's topography adds visual interest and variety to the housing project. The climate is dominated by lack of humidity, big differences between day and night time temperatures.

Cave house formation;

- There are three objectives to be mentioned in the cave house formation;
- To create an innovative building for a town house that will achieve maximum level of desired comfort, but will adhere to energy conservation through all seasons.
- To demonstrate a mechanism which achieve adequate air movement at ground and first floor utilizing traditional method.
- To identify and evaluate the energy efficient architectural building design techniques that comes from traditional architecture.
- The review of practical literature identified in Cave House research a taxonomy of design representations used for assessment and the intermediate representations that the parametric model has defined:

*Aesthetics and construction logic (physical models from flat sheet laser cutting, rapid prototype data)

*Aesthetics (visualisation from three-dimensional models for rendering)

Structural performance (analysis based on structural centre lines, analysis data file definition) *Environmental performance (analysis based on polygon meshes)

* Acoustic performance (analysis based on polygon meshes)

* Costing (panel layout and material quantities for pricing)

Besides the natural and topographic circumstances in Turkish settlements, all those aspects have a strong influence on the building style and have been essential in developing form and construction of housing and its spatial surroundings.

There are five main principles that lie at the core of the natural builder's ethos. These include;

Minimizing "embodied energy" by utilizing raw, local materials wherever possible. -Using simple construction techniques,

Avoiding the use of toxic substances, natural and otherwise, that might create health or environmental hazards during manufacture, construction, and habitation.

Minimizing consumption of scarce, nonrenewable resources, and avoiding environmental pollution during habitation by using alternative, renewable energy sources to the greatest possible extent.

Traditional architecture in this region was very particular about their ecological system, climate, culture, functionality, and proportion of the buildings that fits very precisely with the surroundings. That gives a unique style and character that represents the specific environment and culture.



Fig. 2 Interior for a Cave House (www.turkishcavehouse.com)

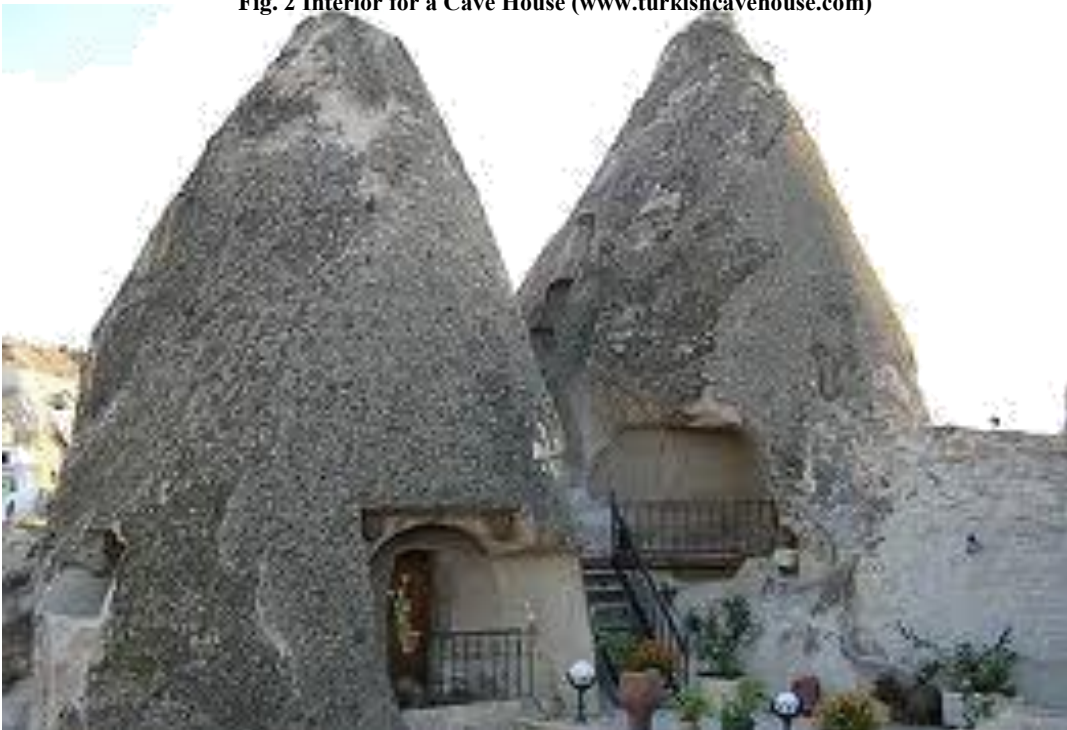


Fig. 3 Two houses nearby (<http://www.virtourist.com/Europe/turkey/Cappadocia>)

Ventilation

The shortage of conventional energy sources, their increasing prices and their environmental impact, have led to re-examination of the general building design practices and the use of HVAC systems.

Conversely, there are some habitual building design techniques that provide sustainable building architecture characteristics and offer comfortable and safe indoor spaces for the residences, while respecting the environment by taking advantage of natural resources.

Strategies for energy conservation are specific problems that arise from the characteristics of the building.

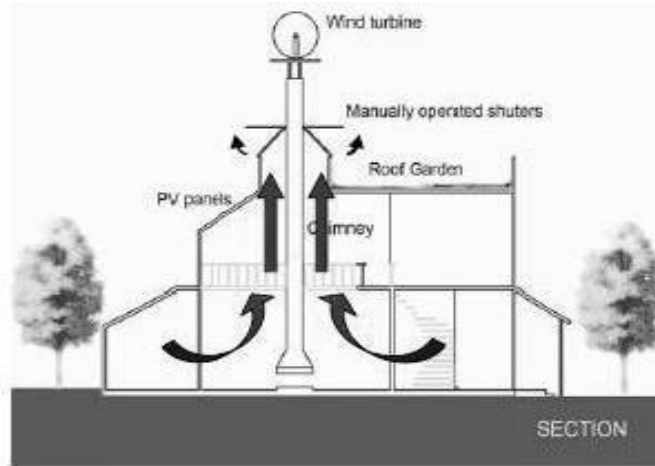


Fig. 4 Ventilaton of Courtyards (Öztürk, 2012)

Courtyards

Courtyards can be in different sizes and accommodate multiple functions. It can function as a hall to connect different rooms of a single house, or as a main street for neighborhood, gathering area for a family or common space for families. The size and shape of the courtyards are determined in part by local building techniques and climatic conditions and in part by the local cultural aspects.

In addition, they also function in reducing cooling loads in the hot summer climate. At night, cool air comes in and cools the thermally massive courtyard walls and floor and these elements hold the “coolness” throughout the hot day

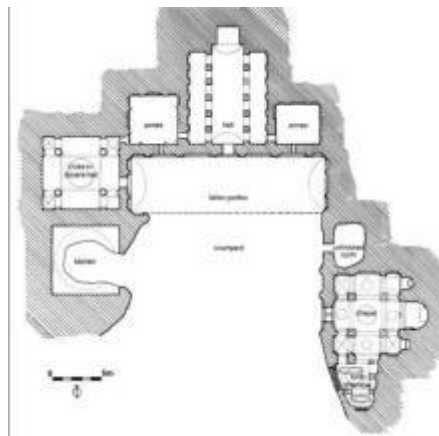


Fig. 5 Hallaç, courtyard complex, plan

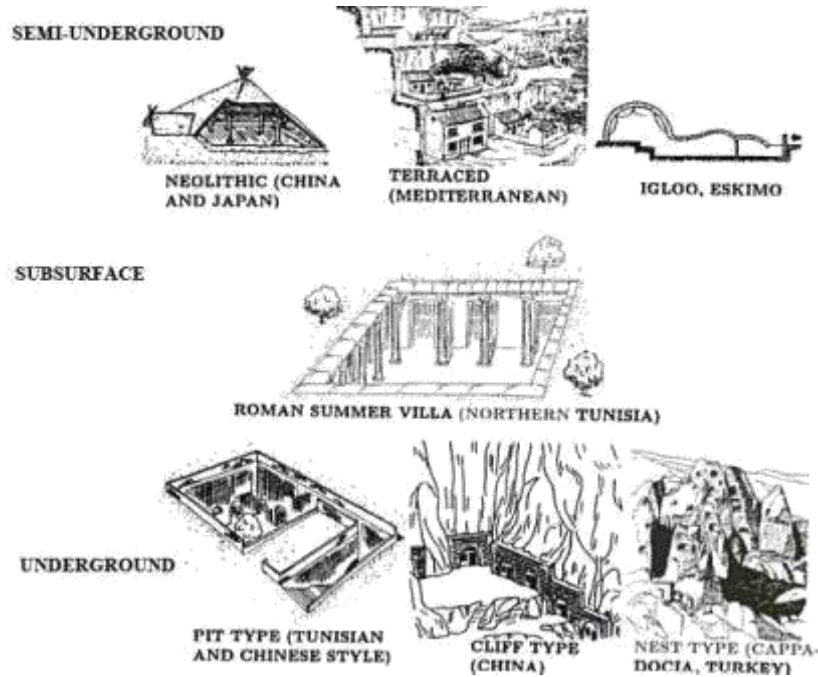


Fig. 6 Typology of underground buildings.

Advantages of Underground Buildings

There are many advantages to underground construction. Underground buildings are less susceptible to the impact of extreme outdoor air temperatures, so they won't be felt the effects of adverse weather as much as in conventional buildings.

Temperatures inside them are more stable than in conventional buildings, and with less temperature variability, interior spaces seem more comfortable.

Constructing a building that is dug into the earth or surrounded by earth, builds in some natural soundproofing. Plans for most underground buildings "blend" the buildings into the landscape more harmoniously than conventional buildings.

And also, their design offers extra protection against high winds, hailstorms, and natural disasters such as tornados, hurricanes and earthquakes.

A big advantage of building repositories underground is that the environment is very stable (Yıldız, 2015).

Disadvantages of Underground Buildings

There are few disadvantages about underground buildings which can be dispelled by appropriate design.

- Humidity which is an advantage in arid climate; in some cases could be a disadvantage, hence, the level of care required to avoid moisture problems, during both the construction and the life of the building.
- Nevertheless, with certain precautions, like special waterproofing, the humidity can be controlled.
- Also, Principal downsides are the initial cost of construction, which may be up to 20% higher than ordinary construction.

Interior Qualifications

Caves are ecologically-friendly houses. They are the most ecologically-sensitive form of construction, and could be combined with an alternative energy system to become almost completely sustainable.

They maintain a constant indoor temperature with natural earth insulation, which also keeps them quiet.

They do not require large amounts of inputs in terms of bricks, concrete, mortar, metal, or wood, and do not demand costly synthetic or ecologically-questionable construction materials.

Parametric analysis on variable structures in Cappadocia interiors should be originally derived one by one. This original context is the main indicator of parametric design methods. Parametric design would help the design activity become more reliable and useful both in interiors and exteriors. .

Lighting

Natural light can be provided not only from doors and/or windows facing the outside, but also by light ducts through holes that can be created by modern well-drilling rigs.

Such light traps usually have convex Plexiglas covers and reflective ducting that capture and transmit the maximum amount of natural light deep into a cave house.

A whitewashed cave interior also reflects more light throughout the interior space than one might think.

Results and Conclusions

The fantastic rock formations used as shells for these dwellings date back millions of years, and much of the more recent architecture has survived for hundreds or even thousands of years despite being laid siege to many times.

In part due to their secret locations and the naturally temperature-controlled nature of the cave interiors, many religious artifacts and artworks have survived for over a thousand years.

All the while, surface structures have been erected and destroyed while modern architecture mixes in strange hybrids with historic temples and above-ground houses. Since almost two thousand years the cave dwellings of Cappadocia play a major role in the regional architecture. During that period many different cultures inhabited this area and used special cave dwellings due to their internalized specific needs.

The climate inside is optimal for living and storing: cool in summer and warm in winter.

Under the aspect of the current conditions and sustainable usage criteria upon parametric analysis; the general aspect to load the necessary function to a cave house should depend on;

- The geographical position and location of the cave
- The quality of the physical and social abilities of the cave interior for the chosen function to be loaded.
- Determining the environmental aspects of the cave before making the interior space designing.
- Creating sustainable interior abilities in order to use the caves depending the nature of their presence.
- Creating functions like museums, artistic and cultural functions as for public usage to reach the most essential spatial organization.
- This important ability to generate construction information directly from design information is what defines the most profound aspect of contemporary architecture education.

Whether or not this type of knowledge implies a different type of architect (e.g., information architect) is subject to debate. What is beyond argument is the fact that the need for this kind of expertise will only grow in the coming years. Therefore, it is imperative that architecture programs pay serious teaching and research attention to the areas of digital visualization.

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