

“ THE STORY OF SUSTAINABILITY ”

(Lessons from Ancient Persian Desert Architecture; the Lost Architectural Heritage)



The present seminar aims to answer an important question:

“How can ancient technology inspire us to create a more sustainable future?”

No.	Type	Ancient technology	Modern technology ▼
1	Air-conditioning System 		
2	Refrigeration System 		
3	Water Supply System 		

► <http://azghandi.net/Seminar.html>

Introduction

► The aim behind the present seminar is to share the history of vernacular energy-efficient structures. The inspiration in promoting these ancient and innovative systems stems from my interest in the interdisciplinary area of 'Digital Cultural Heritage.' By introducing the sustainable features of the most innovative vernacular architectures of the Middle East, this seminar celebrates the cultural and socio-environmental value of the wisdom and knowledge embedded in vernacular architecture. This is a venue for discussions among interdisciplinary scholars, students of architecture, sustainability and education, as well as educators interested in the areas of Education for Sustainable Development (ESD) and digital humanities.

Statement of Problem

► Vernacular architecture is defined as unpretentious, simple, indigenous, and traditional structures made of local materials, whose purpose is to serve a practical need for the community. This architecture is, in fact, an inspiration for modern innovations in sustainable design and planning. Through the years, vernacular architecture has promoted the effective use of natural resources, conscious choices of materials, and construction techniques that result in a low environmental impact on the regional environment. However, in the era of modern massive construction, most vernacular structures are on the brink of destruction, the possibility of which emphasizes the importance of preserving and promoting this cultural heritage for future generations. Despite the latest technological advancements, there is still much to learn from the cumulative knowledge embedded in traditional structures. Reflecting the attainable harmony between humans and nature, vernacular architecture provides useful strategies for tackling contemporary challenges. In this sense, learning from vernacular architecture offers valuable insight into the ways in which ancient technologies gradually evolved and developed their functionality to pave the way for many technologies that are employed today.

Goals & Outcomes

1. *To address Education for Sustainable Development (ESD) by presenting the most sustainable and innovative features of vernacular architecture throughout history*
2. *To enhance immersive learning by developing a virtual museum featuring interactive simulations, 3D models, and the integration of Artificial Intelligence (AI)*
3. *To advance environmental, energy, and climate literacy by raising the participants' sustainability awareness*

The Seminar Structure

► The current seminar's educational contents are presented in four sections:

Section 1:

Vernacular Architecture: Basics & Principals

The first section introduces the basic principles of vernacular architecture and highlights its critical role in the historical development of sustainability. In this way, attendees can become familiar with a variety of strategies for sustainability. Such approaches fulfill local needs by encompassing different cultural and geographical contexts that adapt or modify the natural and built environment. Finally, by exploring the modern use of vernacular architecture in construction and its impact in developing a variety of renewable energy structures, the discussion highlights historical and environmental values and significance of ancient technologies and cultural practices in contemporary and future contexts.

Section 2:

Lessons from Vernacular Architecture

By focusing on a number of traditional energy management systems, the second section of the seminar presents the sustainable features of the most innovative vernacular architectures of the world. The history of three systems employing sustainable practices are introduced, namely:

- *Energy conservation*
- *Water conservation*
- *Buildings and construction*

What underscores the significance of the seminar is its intention to introduce an educational curriculum that is linked to the Sustainable Development Goals and their targets. To investigate the history of sustainable measures for energy conservation (SDG 7.A), there is first a discussion on a variety of energy-efficient structures. Following this, by introducing a number of strategies in water resources management, the second part is dedicated to the history of sustainable practices in water conservation and water-use efficiency (SDG 12.2). Finally, by focusing on integrated and sustainable human settlement planning and management as well as traditional building practices, the third part of the seminar introduces a number of vernacular architectures which have served as symbols of human-environment interactions throughout history (SDG 11.3).

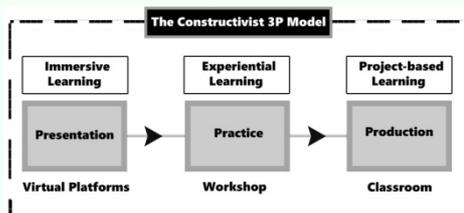
Section 3:

A Constructivist Model in Sustainability Education (Focus: Vernacular Architecture)

The third section of the seminar introduces a constructivist educational model, entitled the 3P Model, which elaborates on the importance of sustainable vernacular architecture in Learning for Sustainability (LFS). With the usage of three educational stages (Presentation, Practice, and Production), the proposed 3P Model advances the learner's understanding of sustainability. This model provides a structured framework for progressive learning that resonates with constructivist and experiential theories.

Employing a VR/AR-based educational model and building upon the learners' basic knowledge of sustainability, the Presentation Stage lays a foundation for further immersive learning experiences. Once the educational content has been presented in Stage One, the learning environment shifts to workshops in which the excitement, interest, energy, and enthusiasm of the learners can be raised by a variety of hands-on activities and arts and crafts, such as 3D puzzles and handicraft projects. Finally, the Production Stage engages learners in more advanced research-based activities during the academic year. Production is the stage in which learners apply their knowledge and skills to create a new idea: a valuable vision that prepares them for future sustainability-related challenges and reinforces their long-term commitment to sustainable practices. As a result, learners not only develop an understanding of sustainability concepts but also create sustainable architectural models inspired by the historical and cultural practices explored in the first two stages. Considering this, the 3P Model enables learners to actively participate in their virtual learning journey (Presentation), construct meaning through hands-on experiences (Practice), and apply their knowledge in practical real-world scenarios (Production).

► In order to provide an overall view of the proposed 3P Model, the following page provides some sample features of this educational approach and its three distinctive phases through a sample case study. This illustrates how the proposed methodology works and functions within a learning environment.



The 3P Model (Presentation-Practice-Production)

Section 4:

A Virtual Museum of Vernacular Architecture: Torus Land

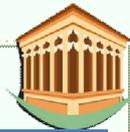


Finally, attendees are given an opportunity to practice 3P modeling within Constructivist classrooms via an online application providing VIP access to a virtual museum of vernacular architecture. This museum enables learners to explore the sustainable features of the world's most innovative vernacular architectures. Therefore, through an AR book, a VR headset, and a compatible application, this virtual museum offers a variety of self-guided tours with interactive simulations, virtual reconstructions, digital replicas, audio navigations, clickable hotspots, and virtual walkthroughs...





Ex. Exploring the History of Natural Ventilation and Passive Cooling
(Focus: Energy-Efficient Vernacular Structures)



In order to introduce the concepts of 'natural ventilation' and 'passive cooling,' two of the most useful strategies in harnessing wind energy, the 3P Model shall first engage the learners in discovering how these fascinating methods work. To this end, the learners will be introduced to a number of vernacular architectures throughout history which have utilized and developed various natural ventilation systems. For example, as a traditional air conditioning system created to provide natural ventilation and passive cooling, the Badgir (or the traditional windcatcher) started to be widely employed 3,000 years ago in the Middle East.

Next is an in-depth discussion on the sample learning agenda within the 3-step methodology:

Immersive Learning

1 Presentation> The educational concepts are presented to learners via an online virtual museum with a self-guided tour featuring a 3D virtual tour, panoramic scenes, clickable hotspots, and audio navigation.



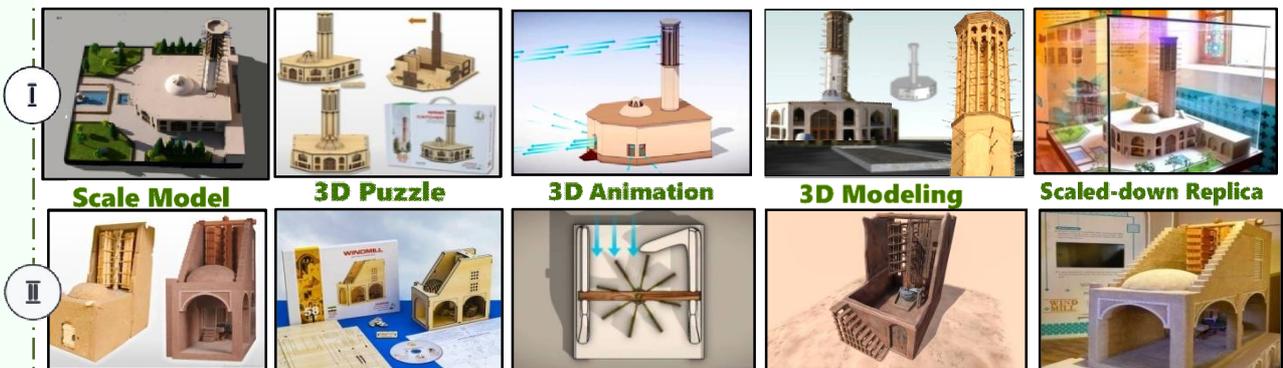
Experiential Learning

2 Practice> After providing a fundamental understanding of renewable energy structures and the basic science that regulates their development, the Practice Stage offers a more hands-on environment and fun learning activities in workshops, such as:



Project-based Learning

3 Production> Considering the sample focus, there shall be further discussion, during the academic year, on a number of structures that have been mainly equipped and built with the traditional windcatcher. This gives learners a deeper knowledge of how different energy-efficient structures throughout history employed natural ventilation and passive cooling. To illustrate this, the following case studies on Persian vernacular architecture serves as excellent examples of desert architecture designed according to climate conditions. For example, as a model of sustainability, the Dowlatabad Garden has the tallest eight-sided windcatcher in the world. Listed as a UNESCO World Heritage Site in 2011, this building is worthy of study as it is the highest adobe-made ventilator in the world. To reinforce the educational concepts of the seminar, there are a number of interactive activities by which the learners may become more familiar with the details of the case studies and their renewable energy structures within the three educational stages, such as:



The second case study is a traditional windmill, called the Asbaad

Introduction

► The inspiration behind these seminars originates from my interest in the area of Education for Sustainable Development (ESD). These seminars explore Iranian environmental management and urban planning, as compared to that practiced in developed countries, analyzes the mismanagement of the public sector and its failure to protect the environment, and focuses on problems involving human-environmental interactions in the context of Iran's environment. This discussion concerns about the three concepts of "a sustainable city," "sustainable environment," and "sustainable future." In the sustainable city session, urban design and management in Tehran, the capital city of Iran, will be elaborated on first, followed by a discussion on the domino effects of Tehran's environmental issues on the other parts of the country. In the second session, Iran's environmental problems caused by unsustainable development are addressed. Finally, the sustainable future session, reviews the role of public participation and civic engagement in improving the quality of urban life and promoting environmental conservation.

A description of each session is provided below:

SESSION ONE

"An Analysis of Urban Planning and Management in Tehran"
(Focus: Sustainable City)

► Considering the irregularities and substandard quality of construction in Tehran, this session reviews the quality of urban planning and management in the city. After providing a short history of Tehran and emphasizing the importance of preserving its historic district, the most important urban problems of Tehran are reviewed. Addressed are issues related to the daily challenges such as, urban water supply systems, waste, and wastewater management. Also discussed are the importance of urban green space, urban open space, and urban furniture in the quality of urban life. Finally, by highlighting the most threatening environmental challenges of Tehran, such as soil erosion, land subsidence, and earthquake, the consequences of the disregard for a spatial planning policy in Iran is discussed. This leads to proposing the relocation of the capital city due to the Tehran's dwindling biocapacity.

SESSION TWO

"An Analysis of Natural Resources and Environmental Management in Iran"
(Focus: Sustainable Environment)

► After having analyzed urban planning and management in Tehran, the seminar goes on to discuss the major environmental challenges currently faced by the whole country. To this end, the 17 SDGs are firstly introduced with a discussion following on the extent to which they have been realized in Iran. Following this, the impact of these goals on the current conditions of Iran's natural resources is studied in three areas: water, soil, and climate. Finally, the novel concept of "Hydraulic Mission Syndrome" is introduced and the advantages and disadvantages of "the thirst for development" approach in Iran are explained. This discussion examines its side effects, such as deforestation, desertification, the drying up of the most important lakes and wetlands (Urmia Lake, Lake Hāmūn, and the Hawizeh Marshes), and some notorious examples of engineering failure in Iran (Upper Gotvand Dam).

SESSION THREE

"An Analysis of the Role of Public Participation in Improving Environmental Sustainability"
(Focus: Sustainable Future)

► After having examined the major issues confronting Iran's cities and environment today, the seminar will conclude with a final session on the role of public participation in improving the quality of urban life and promoting environmental conservation. To this end, the impact of environmental education on raising public awareness of the environment and promoting the conservation of natural legacy in Iran will be elaborated on. This session also draws attention to major environmental issues of the country, such as wildfire, environmental crime, plastic pollution, etc. Following this; the importance of diplomacy and collaboration among the Middle Eastern countries in addressing common environmental issues and challenges will be highlighted. Finally, the seminar introduces some environmental solutions to urban problems by which we can achieve a more sustainable future in the region.