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# TOWARDS EARTH ARCHITECTURE PEDAGOGY — PRACTICAL EXPERIENCES OF TEACHING CLAY PLASTER IN SHIRAZ UNIVERSITY OF ARTS

**Aida Zare Mohazzabiyeh**

**Sobhan Zare Mohazzabiyeh**

Architects and Founders, Gel Studio, Shiraz, Iran  
gelstudioarchitects@gmail.com

## Abstract

Earth was one of the main building materials in ancient architecture for thousands of years but neglected in contemporary constructions. According to the undeniable ecological benefits of earth and the urgency of sustainability in building, studying and working with this material has been developing since last decades. Yet there is a lack of knowledge and experience in academic and professional communities in this field in many countries like Iran. Based on IEQ and thermal comfort benefits, acoustic and aesthetic matters, it is significant to study and learn more about the usages of earth material in interior spaces and to consider workshops and lectures in this field at architecture universities. This article explains both specific theoretical and practical experiences that have been organized in Shiraz University of Arts for interior architecture students of the 6th semester since 2017, in order to help students perceive the potential of earth architecture and develop the knowledge and practices they need to know for applying earth material in interior spaces that resonate with cultural and environmental qualities. The pedagogy of adobe making, clay plastering, Sarooj (Persian lime plaster) and Sgraffito technique workshops, also online workshops during pandemic are mentioned. The targets, the process of practices in each technique and the final results of each workshop are demonstrated.

**Key words:** Earth Architecture Pedagogy, Clay plaster, Sarooj, Sgraffito, IEQ

## Introduction

Teaching architecture in traditional period of Iran was based on transferring experiences of a master to his disciples during years of working. Masters brought up some technicians who were familiar with building materials and methods of construction (Hojat, 2012). Modern academic learning of architecture in universities started on 1940. The basis of this modern architecture education in Iran was inspired by the Beaux-Arts school of Paris and the Bauhaus architecture school of Germany. The basis of teaching architecture in bachelor programs, at contemporary universities is limited to design studios, hence this makes a lack of knowledge in the field of construction (Ghayoomi Bid Hendi, 2006). Due to the importance of working with vernacular materials and techniques, research centers and universities, like Esfahak Mud Center, Yazd and Tehran Universities have been programming several construction workshops in academic communities in recent years in Iran.

On the other hand, climatic crisis, global warming, urban heat island effect, and building related illness are serious problems that make architectural communities tend towards sustainable solutions and using sustainable materials in recent decades. Beauty, simplicity, thermal resistance, variety and flexibility are desirable potentials of earth materials. Earth materials greatly enhance intimacy and sense of space, they are 100% recyclable and have low embodied energy. They have special cultural roles in ancient civilizations like Iran. Therefore, experimenting and learning about them at architecture universities today is substantial.

Due to different biological benefits, IEQ and healthcare matters, cultural values and originality it is significant to restudy and learn more about traditional earth techniques in architecture universities. Selecting appropriate techniques and the way of teaching them in the interior architecture department of Shiraz University of Arts, is the main question of this article.

### **The main perspective of each term workshop**

There is a variety of earth architecture techniques but it is needed to focus on the best culture and climate adapted techniques for teaching in architecture universities of each country. Studies demonstrate that adobe walls, earth plasters, and Sgraffito can be proper techniques for pursuing in Interior architecture faculties in Iran according to their roles in improving IEQ and construction culture.

Adobe was a very common technique in most regions of Iran and its traditional architecture, but different problems like concerns about natural disaster, lack of knowledge and technicians, lack of regulations and standards on earthen construction, modern tendency toward architecture and material, this construction technique has been neglected in Iranian contemporary architecture (Mahdie, 2020).

Indoor spaces of adobe houses usually were covered with clay plasters that gave a nice sense, light and fresh atmosphere to the interior and could improve IEQ. According to the function of the buildings, available materials and climatic matters there are a range of earth plaster diversities in different regions of Iran. Most famous and frequent plasters in interior architecture were “straw and clay” and “Sarooj” (Bozorgmehri & Khodadadi, 2017). Plasters used in the interior of Iranian buildings were usually decorated with many patterns and motifs. One of the famous ornamentation techniques used in Persian Baths is named Saroojbori or Ahakbori. Two layers of plaster were used to perform this technique. The colored second layer serves to create the motifs in relief.<sup>1</sup> This technique has a lot of similarities with the Sgraffito<sup>2</sup> technique.

During some negotiations with the head of the department of Interior Architecture in Shiraz University of Arts in February 2017, about the importance of earth architecture and lack of knowledge in this field in academic and professional atmosphere, it is decided to add “Earth Workshop” as a fix workshop for students of 6th semester in this university. The duration of this workshop like other courses is 16 weeks, contains theory and practice parts, and its target is knowing, touching and feel-

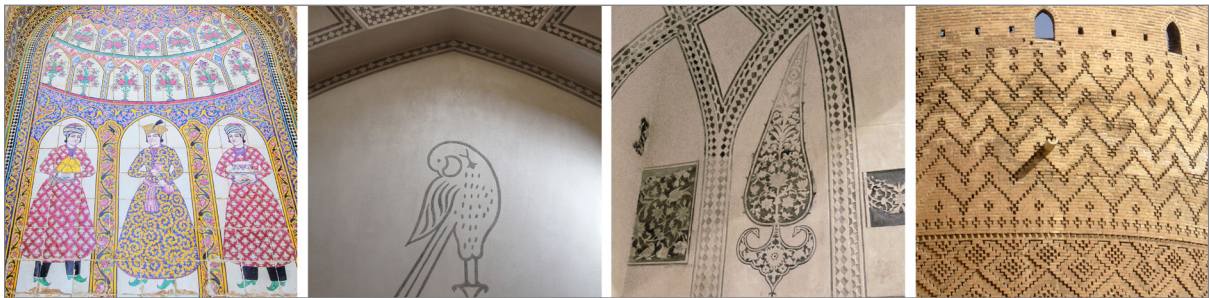
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1 <https://en.irancultura.it/ahak-o-saruj-bori-art-of-engrave-the-limestone/>

2 Sgraffito is a technique produced by applying layers of unfired clay plasters pigmented in contrasting colors, to a wall surface and then scratching it so as to reveal parts of the underlying layer. (<https://clay-works.com/traditional-skills-meet-contemporary-art/>)



**Figure 1.** The first step of making these adobe is blending clay and straw then adding water. The mixture is kneaded well, finally it is molded in frames and dried in shadow. Some adobes in small size have been made for plaster color tests.



**Figure 2.** Different techniques of patterns and ornaments of Shiraz historical monuments were studied in field survey to select and use in ornamenting adobes plasters.

ing the earth material, while studying its pros and cons, ecological benefits, different techniques, and case studies. The theoretical teaching method is based on asking students to work in groups and do research and presentations weekly, also visiting vernacular earth buildings and adobe villages to feel the atmosphere of earth architecture. In the practical part, after learning some basic topics on earth material, adobe and earth plasters are the main subjects. Also, as ornamentation in Persian Architecture is a part of the syllabus in 6th semester, Sgraffito technique is also selected as hands on experience along with earth plastering. At the end of the semester, Students are asked to make and present a work report in the form of a small booklet. Though these activities are specified for this workshop each semester, it can change according to different situations like students' tendency, available materials and equipment. The target of each practical part, program, process and output of each semester workshop will be explained.

### **Gelnegare; ornamented adobe tableau**

Gelnegare is an ornamented adobe tableau, plastered with natural colorful earth. The purpose of this program was experiencing technical know-how on adobe, also learning, practicing and perceiving the potentials of earth plasters.

The Adobes are made by students, with the proportions of 35\*35\*5 cm. Steps to make the adobe tableaux are explained in Figure 1. The plaster mixture is tested in small adobes and some color samples have been made. Some small amount of colorful earth is used to have a raw natural plaster. The ornament patterns are inspired by Old Iranian patterns that exist in traditional buildings of Shiraz (Figure



**Figure 3.** 16 unique adobes were made and plastered by interior architecture students and exhibited in Yazd University. As these massive adobe tableaus are a bit heavy, 2 wooden Trapezoidal shapes are attached behind to hang them up on the wall.

2). Shiraz Qajar Houses have lively and innovative polychrome tiles not only in outdoor facades but also in indoor spaces (Riazi, 2016). Stencils are used to perform some of the patterns, and for the rest, chisels help to carve the patterns on the adobe in Sgraffito technique. An aloe Vera solution is used to cover the final plaster. Aloe Vera is among natural vegetal stabilizers that can improve cohesion and physical and chemical performance of clay works (Vissac, A., et al, 2017).

Sixteen unique adobe tableaus that were made in this workshop were exhibited in Rasoolian Hall in Yazd Architecture University by cooperation of Yazd Vernacular Architecture Research Center. During the exhibition students experienced interacting with expert professors in this field, and also had a visiting tour of Yazd and Meybod adobe architecture sites.

### Sarooj plaster

The main purpose of this workshop was studying Sarooj mortar which is an ancient traditional lime mortar that had been used in plastering wet spaces like Persian Baths. Theoretical and practical experiences on lime material and water resistance plastering were followed in this program. There are several ways of making Sarooj, using various amounts of sand, clay, straw, ash and lime. Persian Baths are plastered and ornamented in two layers of Sarooj. The last layer which is in white color, is scratched back to different depths, exposing the layer below which are usually in one of these colors: black, azure blue or red ocher. After finishing all the process, milk is applied to adhere two layers and make an integrated surface (Bozorgmehri & Khodadadi, 2017). This technique is called Saroojbori which is almost similar to Sgraffito as explained. The motifs of this program are inspired by ornamentations of Nishat Garden Bath in Lar. After theoretical courses some lime plasters in different proportions of ingredients were chosen and tested to find an appropriate mix of aggregates. Two walls and a pool in the yard of the university were designed and plastered by ten students in two layers of different colors, and the motifs of Cypress tree and flower were engraved to expose the color of the layers below (Figures 4 & 5).





**Figure 4.** Lime plastering and Sgraffito of wall in 2 layers. The final layer of plaster should get scratched back before it sets too hard.



**Figure 5.** Lime plaster of the pool. After curving the motifs, milk is applied to make a more resistant plaster.

## Online Earth Workshops

### Clay cylinder

During COVID-19 pandemic, earth workshops have been continued in online courses. The focus of this program was teaching wattle and daub technique and clay plastering. Due to the limitation of working at home, a small scale was considered to make a base and plastering. It was tried to make a coordination between the works of each student in form and color, therefore several rounded pomegranate sticks in the same size, and some amount of yellow ochre pigments were shared to all students. Simple Qashqai motifs were selected for ornamentation and Sgraffito technique. The patterns used in Qashqai rugs are very diverse, beautiful and unique, most of them have been common since ancient Persia, meaning Achaemenid, Parthian and Sassanid dynasty. These motifs often tell the story of nomadic life in an abstract way (Dareshoori, 2014).

After studying theoretical points, one of the most simple and possible techniques with available materials like fiber and earth were chosen for the practical part of the class. The way of working in wattle and daub, plastering and engraving simple Qashqai motifs were taught during the semester by making videos of doing each process weekly. The students were doing the same process step by step every week (Figure 6).

### Miniature adobe wall

Next online workshop during the pandemic was concentrated on making a model of an adobe wall. Adobe walls are mostly thick, they form a natural insulation from the environmental heat (Craven, J.,



**Figure 6-1.** Clay Cylinders are made by rounded sticks then filled and shaped by straw and clay. The envelope of the cylinder is screeded to make a round and acceptable base for plastering. Layer of clay plaster is applied adding ochre pigment, and the motif is carved on it by chisels.



**Figure 6-2.** Layer of clay plaster is applied adding ochre pigment, and the motif is carved on it by chisels.



**Figure 7.** Around 700 miniature adobes are made by each student to make an adobe thermal mass wall. This wall plays a climatic role as a thermal mass; like a part of a Tromb wall or a wind catcher. During this project students learn the techniques of masonry and also plastering.

2019). The target of this workshop was learning more about the role of earth material as a thermal mass in indoor spaces, also adobe walls characteristics, the way of masonry and earth plasters.

After passing the theoretical phase, students were asked to design a passive solar system for one of their design projects and use earth materials as a thermal mass in that system. The process of making adobe and steps of masonry of an adobe wall were explained in detail while making a clay model step by step in 1/20 scale. After finishing the wall by miniature adobes, clay plaster is described and practiced on the mini adobe walls (Figure 7).

## Conclusion

Teaching experience of earth architecture in the interior architecture department of Shiraz University of Arts is demonstrated in this article. This pedagogy is based on general theoretical topics on earth architecture, Visit and travel to earth building sites and practical workshops. Earth architecture

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significance, literature review, case studies, diversity of techniques and its ecological and cultural aspects are the topics that are sought and presented by the students in the group for theory part of the course. Adobe and wattle and daub walls, earth plaster, Sarooj plaster and Sgraffito are the main techniques that have been followed to practice in earth studio in these years. These techniques can be used in contemporary interior design and improve environmental quality therefore it can be beneficial for interior architecture students to practice and realize them at university. At the end of each workshop students are asked to prepare a report of their activities, this can be very helpful to review and notice the details of the practical phase. Earth architecture pedagogy is on its first steps in Iranian interior architecture faculties. Teaching interior earth walls and plastering can be defined in diverse practical programs, revising the reports of the workshops can help academics to provide a better program in this field.

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**Aida Zare Mohazzabiyeh:** 1984, Shiraz, Lecturer at Shiraz University of Arts, PhD of Architecture, Master of Sustainable Architecture. Founder of Gel Studio; Architecture design studio in Shiraz, focus on researching and practicing on natural material, vernacular and contextual architecture, passive design and Architecture for Humanity.

**Sobhan Zare Mohazzabiyeh:** 1988, Shiraz, Master of Architecture. Works as an Art Designer. Founder of Gel Studio; Architecture design studio in Shiraz, focus on researching and practicing on natural material, vernacular and contextual architecture, passive design and Architecture for Humanity.