

LEARNING BY DOING OF TRADITIONAL CONSTRUCTION TECHNIQUES. GYPSUM FLOORING

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Abstract

Active learning of construction techniques is a fundamental stage of architectural education. Learning by doing is much more important, if possible, in the field of traditional architecture, since getting to know materials and construction techniques at first hand contributes to their understanding. This study focuses on the teaching of a construction technique that is falling into disuse (gypsum flooring construction), and this kind of active education provides knowledge, facilitates the survival of the technique and its valorisation, and also the transmission of the dwindling know-how.

In September 2015 a practical workshop was held in Rincón de Ademuz (Valencia, Spain) studying gypsum as a material and its traditional use, both for mortar and plaster, but mainly for flooring. The workshop was aimed not only at professionals (architecture students, architects, quantity surveyors or construction workers), but also at anyone interested in the subject, regardless of profile so that the students' profiles turned out to be an interesting mix. Ages, places of origin and motivations to attend the workshop were very different, which contributed to enriching the experience. The students' profile was multidisciplinary as was their curiosity and interests, meaning that all kinds of questions were answered.

The workshop was structured in three parts. The first one consisted of a theoretical vision of gypsum as a material, its traditional and current production systems, its traditional use and validity in construction, were the first questions of the students to be answered. During the second part of the workshop a series of technical visits to traditional constructions of the area built using gypsum both on structural elements (floors and pillars) and coating (horizontal or vertical) were made. Some of the buildings remained in their original state and some had been intervened, so that students were also able to see the use of gypsum in restoration first-hand. The suitability of the material was emphasised as the most compatible material for these interventions since it was the one originally used. Finally, most of the workshop was devoted to the practical use of gypsum under the directions of two master builders who shared their experience and knowledge. The students experimented and learned how to make mortar, they built the gypsum flooring of one of the rooms of the buildings used as experimental spaces, they also rendered the interior walls of the same buildings, always under the supervision and direction of the master builders, with a complete experience of knowledge of the material and its traditional applications. All the results of these works remain onsite in the building, which is a real structure and not an artificial base, so their behaviour over time can be studied and observed in a real situation, and by students of future workshops as well.

Keywords: Learning by doing, gypsum flooring, traditional architecture.

1 PRIOR CONSIDERATIONS

Given the current approach of university studies, where students are required to pass a series of pre-established basic obligatory subjects, it seems obvious that the compulsory knowledge provided by academic departments is incomplete, and that training is affected by a series of lacunae which can only be filled by the students' own interest and enterprise, either by choosing the (limited) elective subjects on offer to them or through workshops, courses and other activities.

In the case of architecture studies, gaps have been detected in learning about traditional construction techniques, both in theory and practice, as teaching generally focuses on more modern techniques and particularly on theory, while neglecting the practice of these techniques.

In this context we should recognise the importance of recovering knowledge of the basics of traditional architecture, an architecture which provided the foundations from which contemporary architecture has evolved and which should not be forgotten or neglected, given its continuing importance in

buildings both in Spain and worldwide. Thus, although it is possible to approach this knowledge in theoretical and academic terms, it seems more appropriate to approach it as it has been traditionally transmitted over the centuries: through practical learning of construction techniques, just as master builders transmitted their knowledge to their students.

It is clear that not all subjects can or should be learnt in the same way. The case examined is a clear example in which learning by doing is the best didactic option, given that the aim is to promote and recover the know-how of a building technique, which is a practical activity.

In addition, at a time when the motivation of students is being questioned in different spheres, activities such as the workshop explained below have the advantage of interested and motivated students, encouraging and facilitating learning, since as stated by R. Schank, "learning happens when someone wants to learn, not when someone wants to teach". [1]

2 TRADITIONAL ARCHITECTURE WORKSHOP: GYPSUM FLOORING

2.1 Introduction

A traditional architecture workshop, focusing on the knowledge and study of gypsum and its application as a construction material in vertical renderings and interior flooring was held in the third week of September 2015 in the region of Rincón de Ademuz (Valencia, Spain).

The course is part of a series of workshops on the traditional architecture of Rincón de Ademuz, now in its twentieth year. Workshops in recent years have had a more practical approach, aiming to recover some of the traditional techniques and materials in the area. The course in question focuses on gypsum and its different traditional uses, most notably its use in flooring, which is probably the least known traditional use of the material and that most at risk of oblivion and disappearance.

In addition, the organisation of the course has the support of the UNESCO Chair of Earthen Architecture, Construction Cultures and Sustainable Development, as well as that of the Universitat Politècnica de València and the University Institute for the Restoration of Heritage. This backing gives some idea of the increasing importance of activities for the recovery of traditional techniques and trades. However, several years ago when the traditional architecture workshops were set up in Rincón de Ademuz, this type of initiative was in a minority as most efforts focused on contemporary materials and systems, although there is now renewed interest in the subject and traditional architecture is increasingly studied and researched. Nevertheless, the fight against the disappearance of traditional trades continues.

In this respect, workshops like the one described in this article are aimed at all sorts of audiences, from students to construction professionals (architects or construction workers), or to non-specialist audiences. The aim is to recover the technique itself and interest in it, bringing awareness of the material at all levels so that the audience finds out more, architects know how to design it and builders know how to execute it.

2.2 The students

Given that the workshop was mainly practical the number of places on offer was limited to 25 in order to guarantee suitable attention, and although finally 28 students were admitted due to demand this did not reduce the quality of the activity.

As mentioned earlier, a major advantage in activities of this sort is the presence of motivated students who are interested in the subject matter. The workshop was well received and the diversity of the group enrolled had a positive effect on the activity.

Firstly, the students came from different parts of Spain and even France. Although most of them (13 of 28) were from Valencia, there were also students from Madrid, Barcelona, Zaragoza, Alicante, Granada, Navarra, Segovia, as well as two from France.

Moreover, the ages and levels of training were very varied. Ages ranged from 20 to 50 years of age, including students from Universitat Politècnica de València (13 students, mostly architecture students, who were also the youngest), chartered professionals (6), non-chartered professionals (6) and individuals interested in the field with no specific training (3).

Thus, the heterogeneity of the group, with students of architecture and technical architecture, architects, technical architects, archaeologists, historians, builder, students and individuals with an interest in the subject, was an ideal setting for this type of activity. A multidisciplinary team came together, and their individual personal and professional knowledge and experience contributed to understanding and assessing the same work from different perspectives within the workshops. Their varied concerns and interests also provided answers to a wide range of questions of varying importance during the workshop.

It should be noted that, from the outset, putting together such heterogeneous groups requires major effort and dedication from the teachers to satisfy all students.

2.3 Organisation and operation of the traditional architecture workshop: gypsum flooring

The workshop was divided into three main parts. The first of these was a more theoretical approach to the subject matter, the second was a guided tour of the different examples of traditional architecture using gypsum in the area, and the third was the practical use of gypsum as a material for horizontal renderings, especially flooring.

Each part required the use of different complementary teaching strategies aimed at providing better learning of the traditional application of gypsum in vernacular constructions.

2.3.1 Theoretical examination

The theoretical section was taught in a conference room. It consisted firstly of a general introduction to the traditional architecture in the region of Rincón de Ademuz, and especially to the use of gypsum. [2] [3] There was also an expert in historic continuous renderings who did a presentation of the introduction to gypsum as a historic material for construction, explaining its manufacturing, features, types and uses. [4] [5] The presentations adapted to the different levels of expertise on the subject matter consisted of talks with graphic aids during which students were encouraged to contribute with doubts or questions, prompting the creation of a forum for the resolution of the different questions posed, which were all analysed by the multidisciplinary group of students and teachers of the course. The course aimed to provide the initial foundations of a basic knowledge in order to level out the group's knowledge inasmuch as possible, doing so in a dynamic way that prompted an exchange of knowledge between all parties taking part, rather than being a masterclass taught from a stage.

It should be noted that for the duration of the workshop in Rincón de Ademuz, students and teachers lived together so that questions and conversations about traditional architecture and gypsum construction were not limited to class hours, but could take place at any time of the day, encouraging an exchange of knowledge and concerns not just between teachers and students, but also between students amongst themselves. The heterogeneous nature of the group of students contributed to the enrichment of such exchanges.

2.3.2 Visit to real examples

The second part of the workshop consisted of a series of visits to traditional constructions, both restored and in original condition, in the locations in Rincón de Ademuz, where gypsum is the main construction material, in structural elements (floors, ceilings and pillars), horizontal and vertical renderings and other elements.

These technical visits provided the opportunity to see and explain many examples of traditional architecture preserved over time in situ, as in the case of traditional buildings restored using compatible traditional materials and systems, and serving as examples for the theory reviewed beforehand. [6] Thus, this first contact with the constructions helped the students to gain an understanding of their surroundings and highlighted the advantages and disadvantages of the different technical solutions used in each case. Taking advantage of the participation of builders and professionals experienced in the use of gypsum, the constructions visited were compared to the professional experiences of the group, broadly expanding the perception of gypsum as was intended from the outset.

This second part of the course therefore acted as a sort of transition between theory and practice, and as an example of what had already been studied. The aim of this was to provide the students with a first-hand presentation of the final results that can be obtained and the possibilities on offer from

traditional architectural techniques, specifically using gypsum, which they themselves would work with at a later stage.



Figures 1 and 2. Talk and guided visit to vernacular constructions in the region

2.3.3 *Learning by doing*

The main part of the workshop focused on the students' execution of work in gypsum. Although the material had been presented in theoretical terms, showing the results that could be obtained, at this stage students would learn how to use it themselves and the best way to do so is learning by doing.

The actual activity with gypsum was divided into two parts: one dedicated to vertical rendering and the other to gypsum flooring. At this point the group had to be divided into two to ensure sufficient attention to students. These subgroups were organised to include participants with different profiles, maintaining the multidisciplinary facet so that the questions posed and mutual learning could be equivalent in both cases.

Two master builders participated in the execution of this work, sharing their experience with the students, firstly explaining and showing how to do the different jobs so that subsequently all the students actively worked on their own rendering and flooring. In this way, each of the two 14-student subgroups was supported by two teachers: a master builder and an architect who could continue to provide answers to any questions posed, whether theoretical or practical.



Figures 3 and 4. Talk with a master builder and a student experimenting with different types of gypsum

Students learned the execution of vertical rendering in gypsum from start to finish: they experimented and made gypsum paste and mortar, checking setting times, dosages and means of application. This provided them with first-hand knowledge on how to distinguish the different types of gypsum and their main features, while also experiencing the difficulties in application and developing skills to cope with these.

Some were surprised to find that apparently simple activities like rendering are quite complicated. They learned how to work on the mix, to handle tools correctly, to prepare the wall and practice applying gypsum. For many of the participants in the course, especially the architecture students, but also architects and students with no specific training, this was their first time in direct contact with the material, and the first time they had worked with it, applying it with their own hands, with the continuous support and guidance of the teachers.



Figures 5 and 6. Students mixing and applying rendering mortars

As regards the execution of gypsum flooring, students learned and experimented with the correct execution technique, carrying out the work under the supervision of a master builder specialising in flooring and work in gypsum. As part of this learning each of the students carried out the entire paste mixing process executing a small sample on a rigid medium that they were able to take home as an example of their work. In addition, actual flooring was executed with gypsum mortar, and the students worked together in shifts with the master builder, enabling individual needs to be catered for. Thus, they learned and experimented not only with the material itself in the execution of their individual samples, but also learned how to prepare a room for flooring, the suitable organisation of work, etc. In short, they executed a traditional gypsum floor in a real building.



Figures 7 and 8. Students working on their flooring samples and on the gypsum flooring in the room

At this stage it should be noted that the practical activities were carried out in an example of traditional building in the area, not on artificial media created for the workshops. Students rendered the interior walls of the building and floored one of the rooms, a project which has now become part of the building. The building is used as a sort of experimental space where the work of the students of the successive workshops remains, so that they themselves can revisit them, while providing examples and incentives for future workshops as it is also possible to observe the drying process, the effects of the passing of time, etc.

3 RESULTS

The practical activities in which the students learn by experiencing gypsum work using their own hands have been a success as regards the learning of traditional construction techniques.

Doing is always more appealing than simply studying and knowledge is always assimilated better through first-hand experience. In addition, as this is a voluntary course, the students are guaranteed to be enthusiastic. Demand exceeded the number of places on offer, showing the enthusiasm and interest in this kind of activity. The students were very satisfied and showed interest in more workshops of this kind on different materials.

The organisation of this sort of workshop requires a major effort. Firstly in terms of previous logistical organisation, and secondly in terms of the dedication to students during the course itself. These courses are open to students with different interests in the subject and different professional backgrounds, and appeal to all of them, providing theoretical and practical knowledge at different levels. There is no assessment involved in courses of this sort as it is the students themselves who set the level of knowledge and the degree of experience they wish to attain, so that teachers should be adaptable.

The involvement of master builders is essential to learning the know-how of traditional architecture, and to some extent recovers the relationship between teacher and apprentice, the original example of learning by doing.

NOTE

The “20th Workshop on Traditional Architecture of Rincón de Ademuz: Gypsum Flooring” was coordinated by Fernando Vegas and Camilla Mileto. Participating teachers were M. Soledad García Sáez, Salvador Tomás Márquez, Vincenzina La Spina, Andrés Millán Añón and Dimcho Simeonov Kamenov.

REFERENCES

- [1] Schank, R. (2013). El docente y el aprendizaje, in *Conference 20 Claves Educativas para el 2020*. Fundación telefónica, Madrid.
- [2] Vegas, F., Mileto, C. (2001) *Memoria Construida*. ADIRA.
- [3] Mileto C. & Vegas F. (2008). *Arquitectura preindustrial del Rincón de Ademuz, Homo Faber*, Casa Altas: Mancomunidad de Municipios Rincón de Ademuz
- [4] Vegas F., Mileto C., Diodato M., García Soriano J., Grau Giménez C. (2012). Traditional structures made with gypsum pillars: a reasoned hypothesis, in R. Carvais et. al. (eds) *Nuts & Bolts of Construction History* (3 vols), París: Picard, Vol. 2, pp. 509-516
- [5] Villanueva Domínguez, L. (2004) Evolución histórica de la construcción con yeso, in *Informes de la Construcción. Especial yesos*, Instituto de Ciencias de la Construcción Eduardo Torroja, vol. 56, nº493, Consejo Superior de Investigaciones Científicas, Madrid, septiembre/octubre 2004, pp. 5-11
- [6] Vegas F., Mileto C., Cristini V., Ruiz Checa J.R. & La Spina V. (2013) Gypsum as reinforcement for floors: conceptual approach in Mariana Correia et al. (eds), *Vernacular Heritage and Earthen Architecture. Contributions for sustainable development*, London: Taylor & Francis Group, pp. 389-394