BUILDING WORKSHOPS FOR EMPOWERMENT AND SUSTAINABLE DEVELOPMENT. A TRAINING EXPERIENCE IN BURKINA FASO

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Abstract

Economic interests, tourism, international cooperation and the mere export of Western society through the media result in cultural interferences which cannot be avoided in underdeveloped countries. This influence often leads to the creation - through imitation - of new paradigms associated with the image of success and wealth. In settings with limited resources, the alteration of social prestige models leads to the rejection of traditional ways of life, and assimilation has imported and reinterpreted canons which cause cultural impoverishment and worsen the quality of life.

In the case of housing, this influence usually takes material form in the abandonment of vernacular typologies to be replaced by lower quality housing built using cement and corrugated iron which are insalubrious and harm the surrounding environment and landscape. These transformation dynamics, while inevitable and irreversible, can be redirected to improve the quality of life in communities, limiting this cultural impoverishment. In this process, training and raising awareness among the local population are essential, and the role of NGOs can be extremely important. These associations work directly with the parties involved and the result of their projects is often the construction of remarkable buildings that become architectural models in the communities. For this reason, the development of a responsible sustainable architecture for cooperation and increasing awareness and the technical empowerment of the local population are essential tools in guiding this change of paradigm.

This article aims to record the results and reflections of a training experience developed in Burkina Faso and focuses on the installation of roof systems other than simply corrugated iron. As part of the framework for the construction of a secondary school by the NGO Algemesí Solidari, a training programme was carried out based on practical workshops. These activities included both building professionals and local young people, preparing them for the construction of the school roof, boosting their employability and encouraging the assimilation of a technique with the potential to respond to a search for new architecture while providing a healthy and sustainable alternative to construction with cement and corrugated iron used in recent years.

Keywords: Learn by doing, earthen architecture, training for development, building workshops.

1 INTRODUCTION

This text examines the professional training experience carried out in Burkina Faso by a team from Universitat Politècnica de València (UPV) in January 2018, providing technical support to the NGO Algemesí Solidari.

Founded in 1991, this organisation aims to carry out activities to raise awareness on the city of Algemesí. Since 2009, many of the actions of this NGO have focused on the village of Baasneeré (Burkina Faso) through the local association Buud-Bumbu in Bao/Baasneeré (A3B), with which they have worked continuously, cementing this close contact in 2012 when the two locations were twinned.

The joint work of Algemesí Solidari and A3B has led to the development of various projects focusing on working with children and several initiatives for improving facilities for the population, including the construction of a well and the renovation of a maternity ward building. In 2013, both associations embarked on a common project for the construction of a secondary school in the village so that local teenagers would not have to travel 30 km to the nearest school, a situation which has often given rise to early school abandonment.

The architectural design proposed by Algemesí Solidari aimed to employ earth to build an affordable sustainable building linked to the local constructive tradition, and easily learnt by the residents of Baasneeré. From the initial design stages, a specialist research group from UPV has been collaborating with a team from Algemesí Solidari to provide scientific support whenever necessary.

The *ConBurkina* Project, presented in this text, has been incorporated into this dynamic to offer technical advice and a professional training programme tailored to the residents of Baasneeré through local participation in the work, building vaults using compressed earth blocks (CEBs) to provide a roof for the school. This solution is expected to offer a more sustainable alternative in terms of production and execution, as well as students' health and wellbeing, than that of a conventional construction with format and technology imported from Europe.

2 CEB AND TILE VAULTING

Compressed earth blocks (CEBs) are small modular elements produced by compacting a given amount of earth stabilised with a small amount of cement or other materials. They are used to build walls and can be used as bricks by workers with little specialisation [1]. These resistant insulation elements can be used in the construction of comfortable breathable buildings [2] with a minimal environmental footprint.

In most cases, CEBs are used in the construction of walls and vertical elements. However, using the technique of tile vaulting they can cover spaces, therefore producing buildings primarily made of earth. The vaults are stable and resistant, but require the use of centring during the construction process. The size and amount of centring needed depends mostly on the type of technique used.

The tile vaulting system used in this experience is based on the use of fast-setting mortars and thin pieces to construct lightweight vaults which require very limited centring [3]. These characteristics make CEB tile vaults optimal solutions for the construction of horizontal contexts with limited industrialisation where wood is scarce.

3 OBJECTIVES

The main aim of this educational experience was to provide the scientific-technical support required in the construction of the school vaults. In order to do so, different construction professionals and potential participants in the building process were trained in the use of the system. In order to ensure this technique was assimilated, and therefore easier to use outside the project, this training activity included construction workers from the development company in charge, as well as local residents. A training workshop was also held in the capital (Ouagadougou) with other companies and self-employed professionals.

In addition, attempts were made to contribute to the empowerment of the local population and their endorsement of the project through a vocational training course for local young people on the use of this technique. The course approach could be summed up in the following goals:

1. *To encourage knowledge of materials and local resources to be used in construction*. The construction of the school will help to promote a type of learning which can be transferred to other types of building. This is a response to United Nations Sustainable Development Goal 11: "Make cities and human settlements inclusive, safe, resilient and sustainable" [4].
2. *To bring the use of CEBs and the construction of tile vaults to the residents of Baasneeré* so that they can make it their own, seeing it as a technical improvement on their traditional architecture that will allow them to improve their buildings while continuing to use local materials suited to the local climate conditions, encouraging resource sustainability. This is a response to United Nations Sustainable Development Goal 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" [4].
3. P*romote the capacity for producing and generating resources of the inhabitants of Baasneeré*. At present, the local economy is based on subsistence agriculture and livestock, with barely any economic activity, which often hinders the training of local young people, preventing them from improving their living conditions. This workshop aims to provide these young people with a technical base that will allow them to be contracted as builders during the construction of the school so that they can practice the knowledge acquired and start a professional career in the building sector. This is a response to United Nations Sustainable Development Goal 8: "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" [4].

It is hoped that in addition to offering a group of local young people professional training providing them with a chance to improve their living conditions, their involvement in the school construction process to help promote a feeling of endorsement of this building in the local community.

4 WORKSHOPS

The activities to be developed follow a “learning by doing” methodology [5] based on a learning process where the conventional teaching model is reversed. The execution of a specific practical activity is used as a starting point to deduce the rules and theoretical knowledge which have made it possible.

Following this process of progressive abstraction of knowledge, workshops are made up of three parts. An initial brief introduction to the vaults and technique to be used was followed by a practical construction exercise which included the manufacturing of necessary auxiliary means and their use in the construction of a vault. Thirdly, a small theoretical module was developed presenting numerous real examples to showcase the potential of the technique. This practical design activity allowed them to explore the possibilities of this system.

4.1 Introductory session

The workshops began with an introductory session describing the course programme and briefly explained the constructive system to be learnt and its usefulness. This introduction was complemented with photographs from real cases which used it to help understanding of this technique.

The professional training workshop for Young people from Baasneeré was held in a space beside some classrooms built in an initial phase of the school design. This pavilion has been a good teaching aid for the introductory session as students could examine the vaults (built using a different technique) and compare them with the examples previously provided in order to encourage discussion.

4.2 Session on the design and construction of tile vaults

This session was divided into two different activities: a workshop on the design and construction of centring and another on the construction of vaults themselves. In order to make the activity dynamic and effective, students were divided into groups of seven and worked separately on the construction of a vault.

The aim of the first workshop was for students to learn a simple system for the design of centring on the construction site, understanding how important a correct outline is in ensuring stable vaults and checking they were able to produce all the auxiliary means needed for vault construction.

Figure 1. Placement of wooden centring.

The second workshop consisted in the construction of a tile vault with CEBs using the centring built in the previous activity. This task allowed students to put this constructive technique into practice, learning basic execution concepts such as the importance of ensuring vaults were firmly supported or avoiding continuous joins. Moreover, this task also introduced them to the use of gypsum as a construction material for producing the mortar for the pieces.

This session ended with a joint discussion from which the main lessons learnt were extracted while the main aspects to be taken into account were highlighted.

Figure 2. Construction of vaults with CEBs.

Figure 3. Final result of the vaults.

4.3 Session on the design of vaulted spaces

Once students understood the usefulness of tile vaults and applied the constructive system a third session for exploring the architectural and expressive potential of this technique was held. The aim of this workshop was to prompt an assessment of constructions with tile vaults where these were seen positively as comfortable, useful and beautiful buildings. This activity was included in the Baasneeré professional training workshop solely to encourage feelings of appreciation and attachment towards the school building.

This session was divided into two parts. An initial theoretical activity was carried out using audiovisual resources and explaining a series of buildings with tile vaulting, using the formal and expressive qualities on offer from these systems to their full potential.

Students were then divided into two groups, in charge of designing a building based on funicular models [6]. These models are based on the capacity of gypsum-soaked fabric to hang down and generate concave shapes. When the gypsum in which the fabric is soaked hardens, the models can be turned over transforming these shapes created by gravity into vaults, arches and domes.

At the start of the activity the groups were supplied with fabric, reeds and string. They had to use these materials to build a frame, placing the fabric so that it formed an inverted figure of the desired space when hanging. Once the model was complete, soaked in gypsum and left to dry, students discussed the way in which the vaults worked.

This activity provided students with a more abstract understanding of the technique and even allowed them to work on aspects relating to the design of the spaces, showcasing the possibilities of the new technology acquired in other buildings such as their own dwellings.

Figure 4. Funicular model workshop.

5 CONCLUSIONS

Following these workshops some interesting conclusions were reached. The activities have been structured following an inductive logic [7] which has answered the questions *What are we going to do? How is this done? How much effort does it require? What possibilities does it offer? How can I make the most of this potential?* This process, which starts with an individual case and goes on to generalise, has proved useful for a traditional collective used to repeating conventional procedures and unaccustomed to abstraction and creative work.

These two workshops together provided training for 35 individuals with very different profiles: architects, civil engineering students, builders (self-employed or employees from four development companies), manufacturers of CEBs and young people with no training. By involving all participating agents in the process (manufacturers, developers, specialists and receiving community), the aim was to generate a comprehensive chain for the assessment of this technique which could be used beyond the construction project for the school. In this regard, the participation of specialists has added to builders' interest in the technique, as it is seen as a potential source of commissions.

The training provided to local young people is a rare opportunity in a setting with such limited economic activity and will hopefully lead them to their first paid employment during the construction of the school. In addition, holding this workshop in the community has helped spark the interest of the local population, with constant visits from the local leader, his committee and the children who study in the classrooms already built. This curiosity, along with the conviction that they are contributing to the construction of the school, is expected to encourage its positive acceptance within the community.

Figure 5. Students from the secondary school during the workshop.

NOTE

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REFERENCES

[1] NACHER, J.; MARAVILLA, J. V.; FERRAGUD, X. & GÓMEZ-PATROCINIO, F. J. “CEB production in social insertion workshops. An experience in Algemesí (Spain)”, in *Vernacular and earthen architecture. Conservation and sustainability*, p. 399 – 402, eds. C. Mileto, F. Vegas, L. García-Soriano & V. Cristini. London: Taylor & Francis Group, 2018.

[2] BARBETA, G. & NAVARRETE, E. “A pentagonal block home”, in *Earthen architecture. Past, present and future*, p. 31 – 36, eds. C. Mileto, F. Vegas, L. García-Soriano & V. Cristini. London: Taylor & Francis Group, 2015.

[3] GÓMEZ-PATROCINIO, F. J.; ALONSO, A.; MILETO, C. & VEGAS LÓPEZ-MANZANARES, F.” Optimización geométrica de trazados funiculares en el diseño de bóvedas de BTC para forjados”, in *Memorias del 16º Seminario Iberoamericano de Arquitectura y Construcción con Tierra*, eds. R. Meyer and C. Neves. Asunción, Paraguay: Universidad Nacional de Asunción – Red Proterra, 2016.

[4] ASAMBLEA GENERAL DE LAS NACIONES UNIDAS. *Resuloción A/RES/70/1: Transformar nuestro mundo: la Agenda 2030 para el Desarrollo Sostenible*. Naciones Unidas, 2015.

[5] RAMA, V. DASARATHA y ZLOTKOWSKI, E. A. *Learning by Doing: Concepts and Models for Service-Learning in Accounting.* Washington, D.C.: American Association for Higher Education, 1998.

[6] SONGEL GONZÁLEZ, J. M. “Form follows forces. Building funicular models to show how gravity shapes form”, en *7th International Conference on Education and New Learning Technologies (EDULEARN 2015)*, p. 621 – 626. Barcelona: IATED, 2015.

[7] BRUNER, J.S.. Narcea S.A. Ediciones, Madrid, 2001.