


Project for the introduction of a materials library within a conventional library of a university degree in architecture

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Abstract

This communication presents a recent and unprecedented teaching experience in the degree of architecture in a polytechnic university related to the training of its students, which incorporates the library as a mixed centre of resources on materials. Its aim is to overcome the gradual separation of new students from the analogue world in favour of the digital world. The aim of the experience is to implement a materials library in the library, as a teaching resource for self-learning outside the classroom, oriented towards subjects in the field of Architectural Technology. It is an initiative with potential results of interest to higher education professionals, involving the library, the collaboration of subject teachers and a link between the digital and analogue worlds. The project is laborious and will be rolled out over several years, but the preliminary results are promising.

Keywords: *materials library; degree in architecture; university library*

1. Introduction

The university degree in Architecture in Spain is characterised by the inclusion of many subjects oriented towards building technologies. These technologies have evolved considerably since the end of the Second World War in the 20th century and this is reflected in the large number of new materials that have appeared on the building market since then.

Traditionally, the students who entered these studies came mainly from families already professionally related to the building sector and their previous practical knowledge on materials and the processes of execution in building was sufficient to complement the theoretical teachings they received at the University. The current situation is different and the background of the students no longer guarantees this previous knowledge. Society, and

therefore also the University, has fully entered the era of digitalisation, which has had an impact not only on the profile of students, but also on the development of higher education.

Within this framework, the initiative was developed to set up a materials library oriented towards building materials, within the University Degree on Architecture at E.T.S. Arquitectura del Vallès (ETSAV) of the Universitat Politècnica de Catalunya (UPC). A materials library is a collection of selected materials to facilitate the learning process about their characteristics, properties, attributes and uses. In a materials library, physical samples of different materials are collected, which will be exhibited to their specific public according to classifications established by the institution that gives life to it (Dent, Moryadas, and Beylerian, 2005). The overall objectives of this initiative were thus diverse, but concurrent:

- Extend the traditional educational role of university libraries as centres for printed documents, incorporating a collection of samples of building materials, for consultation and loan, as an additional academic resource to support teaching, both for the lecturer in the classroom and for the student in self-study.
- Bring the analogue world of building materials in contact with the digital world through remote consultation of bibliographic documents linked with building materials.
- Make up for the previous deficiencies of university students of architecture in terms of analogue information on building materials, which often prevent them from recognising, discussing and applying them on their educational issues.
- Encourage students to be able to substantiate and support their architectural proposals developed and presented in the classroom, not only by means of drawings, reasoning and models, as is usual, but also by providing samples of the specific materials that would actually be used in the projected building (Bonwell & Eison, 1991).

2. Theoretical framework

Traditionally, some University Polytechnic Schools had collections of real samples of materials, generally deposited in showcases only for exhibition, but inaccessible directly to students. These collections have decayed partly due to lack of maintenance and people in charge, but also partly because the digital networks are providing texts, images and videos of great quality quickly, free of charge, of universal access at any place and at any time.

On the other hand, building products companies are promoting a renewal of their products, based on innovation in order to adapt their performance to the new demands of sustainability, efficiency and digitalisation. This divergence between the greater diversity of the commercial offer of materials and the loss of physical presence of materials in higher education curricula can lead to a partial ignorance of the future prescriber. Any education training for design and

construction must deal jointly with sensorial aspects, information aspects, knowledge aspects and application criteria aspects (Pedgley, O.; Rognoli, V.; Karana, E., 2016).

The choice of architectural materials has never been greater and architects use materials coming from around the world in innovative ways as never before. Borch, Kenning & Kruit (2004) edited a book that catalogues 200 different architectural surface materials. Each material is shown on the right-hand pages via a full-colour picture, which gives the reader the impression that is standing right in front of the real material, and on the left-hand pages is shown applied examples by architects and a description of the characteristics of the material.

The materials information aspects have experienced a growth in volume, which has been managed through databases whose access on line is free of charge in university libraries. The knowledge aspects are being developed within specific university subjects, where aspects of the anatomy of materials and their expected performance are addressed; anatomy requires images and static models for understanding and performance requires sensorial experience or simulators. The application criteria aspects are trained in the project workshops, where the aspects of suitability, contingency and adaptation to the environment come together; the student must learn to establish, in each case, the prescription that best integrates them in a timely manner. In the short term, the learning of all these aspects is based on the resolution of cases and the corresponding public critique in the classroom. In the medium term, work experience guided by mentors, complete the training of the future professional.

This polyvision of university education suggests to create a materials collection as an educational resource where the tangible and intangible aspects of the building materials are interconnected, in order to give complementary support to the development of the three aspects mentioned above. Robison & Shedd (2017) argue the importance of the availability of collections of shared things in learning communities. Accessibility to these collections raises the knowledge status of users. A materials library of building materials is a valuable resource for dialogue between designers, teachers, students and guilds; by having direct contact with the sample, the vocabulary and organoleptic aspects of the material can be better comprehended (Bonwell & Eison, 1991) (Rognoli, V., 2005). It also allows active self-learning by relating and associating the materials with the senses and with their actual application (Hegger, Drexler & Zeumer, 2017).

The term "materials library" could also include content provided by augmented reality if a link is established between digital content and physical samples (Riemer, Schellhammer & Meinert, 2018). Lyons (2007) argues for the importance of knowing the characteristics of materials in order to understand their contribution to building systems. Many of these properties are not evident to the senses without testing the materials in laboratories. All this arguments focus on the project for the introduction of a materials library within the conventional library of a university degree on architecture.

3. Referents

A case study of materials libraries was undertaken in order to learn about their functioning, both the common and unique aspects of each library (Arboleda, 2023). Following an online search, many cases from around the world were identified and analysed. The compiled information was then entered into a series of fact sheets identifying name, website, location, consultation interface, information available for each material and classification of the materials.

3.1. Classification on focus

On the basis of the above, a first classification of the cases was established based on its main focus:

- Materials libraries with a focus on innovation: they specialise in collecting recent materials, which are making their debut and which presents innovative and evolving properties (Peters, S., Drewes, D., 2019). They also offer annexed spaces for experimentation, exhibition, workshops and discussion rooms, where scholars can congregate.
- Materials libraries with a focus on sustainability: they specialise in collecting materials that, due to their origin and manufacturing processes, are considered sustainable (Peters & Drewes, 2019).
- Materials libraries with a focus on innovation: they are located within a higher research environment with the aim of being a bridge between academia and the industrial corporations. They are supported by research and development groups within the institution to which they belong. Their collections promote joint training, research and innovation campaigns.
- Materials libraries with a focus on education: they are aimed at collecting basic and conventional materials in order to provide a first approach to young professionals in training. They are the common basis from which other more specialised collections can be developed in the future (Hegger, Drexler & Zeumer, 2017).

3.2. Identifying variables of a materials library

The specific identity of each library results from the combination of:

- type of primary user to whom the collection is addressed,
- access that this user has to the materials samples and the associated digital information
- resources, public or private, with which the materials library is developed. According to Jansson (2013), the availability of these resources strongly influences the services provided by the library: guided tours, professional consultancy, institutional consultancy, etc.

In that sense *MaterialConnexion*, one of the most extensive collections of materials in the world with over 20 years of presence, is a private materials library focused on users who are already active in the professional environment. Its main resources comes from the fees that its subscribers pay to access its comprehensive database that feeds the constant flow of information that is displayed in all the media channels in which this materials library has a presence (books, web channels, showroom, etc.)(Addington & Schodek, 2005).

3.3. How to house and exhibit the collection

At the moment, there are several dimensions in which the materials library can be displayed:

- Physical dimension: The user has the possibility of interacting directly, and in a tangible way, with each material and with the information that accompanies it, usually printed. In a direct way, those properties that can only be perceived face-to-face can be appreciated (Hegger, Drexler & Zeumer, 2017).
- Virtual dimension: It allows providing all kinds of digital content on each material, very useful in research or suitability assessment activities. This type of library can be updated very quickly, is remotely accessible and allows its own information to be linked to other data available openly on the global network (Spector & Ifenthaler, 2010).
- Hybrid dimension: It allows adding the complementary potentials of materials displayed both physically and virtually.

3.4. The taxonomic classification of samples

In the materials libraries there is no actually a shared standard for taxonomic classification; each materials library adapts its taxonomy according to the speciality of its samples collection: nature of the material, physical and/or chemical properties, function of the material, and form of the material or manufacturing process (Dantas & Bertoldi, 2016). A collection of materials in a user-friendly order makes it much friendly for the user to navigate and consult those (Peters & Drewes, 2019).

One of the references close to this project is MATERFAD, a materials library located in Barcelona and with delegations in Latin America, with 15 years of social presence. A face-to-face interview was held with its managers to know their organisation first-hand and learn from them. One of the pieces of advice that came out of these conversations was to strictly delimit the information associated with each sample of material because its management can devour a large amount of resources.

4. Proposal

4.1. Origin of the samples

There are already samples of materials scattered around the School of Architecture, without any order or classification, which can potentially be reused for this materials library project, and it is therefore planned to initially collect these samples and add them to the materials library in formation. Once this first internal compilation stage has been completed, the academic community will have to decide on the profile of the new materials to be incorporated according to the specific orientation of the courses taught by the curricula.

4.2. Taxonomic classification

In this case, the project materials library is part of the university library, which already has its own classification system (Joudrey, Taylor & Miller, 2015). The challenge is how to interface with the taxonomic classification already in place in the building industry, such as CI/SfB (RIBA cpd.com). At the moment, this conflict has not been tackled head-on, but it has been decided to continue with a classification specific to the building sector, as is already the case with other new things collections on loan in the university library.

4.3. Location

Actually, the physical space for the location of the materials library is inside the room library of the School of Architecture, housed in rolling chests named by the material nature so that the samples can be easily transported, which is useful for the student, the librarian and the teacher in different exhibition environments. In the future it will be necessary to have a better display, capable of visually displaying the samples and at the same time facilitating self-loaning with the help of a smartphone.

4.4. Augmented reality

One of the goals of this materials library is that each sample of material is linked to the information available about it in the university library itself. This linkage should enable the conventional library to be fostered as a useful tool for self education and learning, both for present users and online visitors. This alignment should facilitate the possibility of continuously updating and expanding the information collecting data available online, fostering interactive and collaborative learning (Scoble & Shel, 2016).

4.5. Development of the project

The entire development of the project has been carried out in collaboration with the students because of the educational potential of participating in its evolution.

- 1- Collection of the samples already available but dispersed, taxonomic classification, photography and deposit in the wheeled chests.
- 2- Labelling of the samples and referencing in the library catalogue, so that they can be borrowed and linked by QR code to the associated virtual content.
- 3- Edition of the virtual contents linked to each sample: books, articles, videos, patents, doctoral theses, applications, companies, etc.
- 4- Development of the specific platform for exhibition and lending.
- 5- Presentation of the materials library project to the university community. Initial validation by means of interviews with students, teaching staff, researchers, librarians, etc. The intention of the validation is to know the needs and expectations of the different users in order to have a global vision of the resource offered and the most convenient way of structuring the search and the information.

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