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Emergency lighting cabinet for fire safety learning

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ABSTRACT

The aim of this innovative educational project is to encourage students' interest in one of the most underrated fields of fire safety: emergency lighting. So this educational project aims to combine the relationships amongst the evacuation safety theory, real manufacturers products and an specific software for its usage. In order to achieve it, a 'technical cabinet' has been designed and built for its use in the Laboratory of a University School. The design, content and learning system of the cabinet confirmed the validity of the initial concept during the first year of use. A protocol has also been developed for the technical cabinet, so that the teaching experience may be of use in other Schools of Architecture.

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Introduction

Education in a School of Architecture (for both architects and building engineers in Spain) has to cover all fields involved in construction, from design theories to technical areas [1], also incorporating new pedagogical theories [2–6] (Fig. 1).

Within this context, the School of Architecture where this prototype has been created, has developed a very important activity related to fire safety inside the technical sphere [7]. The technical cabinet described in this article fulfils other laboratory activities focused on increasing the practical knowledge of these aspects to architects, not to fire engineers.

There are other simulators for engineering learning and, of course, for future fire engineers [8,9], but it is supposed that they are not as practical as this one (Fig. 2).

Background

The goal of the Building Services and Energy Section of the School of Architecture where this experience has been carried out, is that newly-graduated students will have been trained to design, calculate and integrate the various Building-related Ser, including fire safety parameters.

Although it is unusual for an architect to receive such intense training in Building Services over four years [10,11], it was intended to offer the students further practical knowledge by bringing simplified real building services elements closer to the lecture-room.

The three technical cabinets contain the most common facilities in buildings of a certain size: fire safety, electricity and a heating/cooling system [12].

In this School of Architecture, the teaching of fire safety facilities starts at the second academic year and during the last course that students have to design and integrate all facilities into their projects, when most questions and problems arise, and it is in this final year that the previous technical cabinets are used.

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After having explored all the existent solutions available on the market and checked that none of them fulfilled the teachers necessities, it was decided to design and build a specific technical cabinet to transfer the knowledge related to emergency lighting.

It is important to note that students learned the general principles of these types of systems before in the theoretical sessions, so they are not learning specific software/equipment, but the solutions that market offers today in a similar way that they will find when starting their professional careers. In fact, cabinet is ready to assume every year changes for fixtures, fittings... with minimal maintenance work. And due to all these reasons is why this experience is intended as a novel means of making building services more attractive to students through hands-on learning.

Methodology

Taking the dimensions of the original technical cabinets, two companies were contacted in order to explain to them the teacher staff requirements.

Both the high number of students and the anticipated mobility of the cabinets have led to their construction with solid and durable materials, which ensured low maintenance costs and high reliability despite intensive use.

Both companies seemed to be very interested because, apart from the publicity of its execution, it was a big opportunity to develop a new product that did not exist on the market.

These triangular collaborations (University + technical cabinet manufacturer + emergency lighting manufacturer) were focused on two aspects until to achieve the final result:

- Definition of the physical elements and concepts that wanted to be shown.
- Definition of the software which managed the different actions that could be done.

The Academical Quality System of the University undertakes to carry out polls to 100 students of the subject every year. To really know the effects of this cabinet on student learning, it was compared the numerical ratings of students and their comments in the polls in the year prior to their implementation and after. Numerical ratings were better and written comments from students are explicitly related to the improvement and importance of these elements learning in the laboratory and not just theoretically.

Components description

Fire protection is, unfortunately, one of the least discussed technological elements at Schools of Architecture. That is why in addition to theoretical teaching, practical instruction, with this technical cabinet (as this case) is of the greatest importance.

The elements used in this cabinet are the following (Fig. 3):

a. *Connection.* Supplies all elements of the cabinet.
b. *Electric control panel.* Allows to switch on and off all the lights of the cabinet. It is composed of one main switch and four partial differentials.
c. *Isolator ST-200.* Allows to check that the communication between the cabinet and the computer is correct. There are two of them installed. One receives the data of three luminaires. The other one receives the status of the battery and the other two lights.
   Isolating switch of the BUS for connecting a maximum of 200 luminaires. Enables checking of the secondary BUS lines

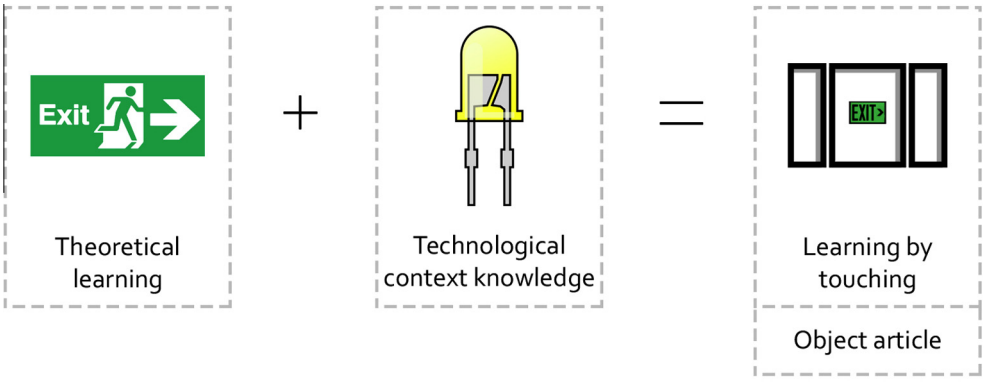

Fig. 1. Graphical abstract.

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