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Informal interactions in 3D education: Citizenship participation and assessment of virtual urban proposals

David Fonseca ^{a,*}, Francesc Valls ^b, Ernest Redondo ^b, Sergi Villagrasa ^a^a La Salle Barcelona Campus, Ramon Llull University, Barcelona, Spain^b Expressió Gràfica Arquitectònica I, Universitat Politècnica de Catalunya, Barcelona, Spain

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ABSTRACT

The main focus of this study was the inclusion of informal methods in the educational frameworks of architectural and urban design. The project used is based on the 3D representation of virtual models of new urban proposals in order to re-organize a local market in Tonalá, Mexico. Starting from a formal course, where the students had to develop solutions to real architecture and urban problems, a second phase was designed, based on feedback in an informal environment by the end-users (citizens and professionals). The key objectives of the experiment were to show students to connect and receive feedback through technology, evaluate how these interactions can define new informal ways of learning, and discuss how this informal data can be incorporated into an academic curriculum. The results confirm how the informal interaction constitutes a great contribution in the improvement of student's skills, even considering that the incorporation of informal data into their evaluation still remains challenging.

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1. Introduction

Information Technology (IT) represents a set of tools and applications that allow the incorporation and strengthening of new educational strategies, many of which have been defined in new teaching frameworks in the last two decades (Dede, 2000). In recent years, the use of ITs has spread to all levels of our society. The affordability of prices and the popularity of devices and applications have enabled its ubiquitous presence in leisure, relationships, work activities and of course teaching. The adaptation of contents and applications in this area has emerged as an interesting field of study to assess the degree of motivation, satisfaction and usability of students (Redondo, Sánchez, Fonseca, & Navarro, 2014), and their academic improvement (Fonseca, Martí, Redondo, Navarro, & Sánchez, 2014). To evaluate these premises, the standard approach is to start from formal educational approaches and quantitative studies, but as has been recently demonstrated (Fonseca, Redondo, & Villagrasa, 2014), qualitative approaches are equally valid and allow a more accurate characterization of the teaching experiences,

especially when these involve IT.

On the other hand, informal learning is a potential tool to evaluate the citizens' response and is typically associated with other fields of science, technology, engineering, and mathematics (STEM) education (Gray, Nicosia, & Jordan, 2012; Mueller, Tippins, & Bryan, 2012), and a basic skill to be developed specially in the education of future urban planners, architects, or building engineers. The importance of informal learning lies in the fact that 70% of a person's learning is done informally, either at work or at school (Marsick, Watkins, Callahan, & Volpe, 2006). While the veracity of this rule can be discussed, it cannot be disputed that the designs of architects, urban or building engineers will be used by the citizens, and the citizens' response and evaluation will be essential to develop successful projects and proposals. As students' progress from high school to college and graduate schools, the role of informal learning becomes increasingly important because learning can happen anywhere at any time (a key concept in the learning process of architecture students, because architecture is everywhere). As Banks et al. (2007) propose, our students acquire knowledge as a result of interactions between connected partners.

New technology implementations in the teaching field have been largely extended to all types of levels and educational frameworks. In recent years, in addition to technology use in the classroom, new areas of research are opened to assess and

* Corresponding author at: La Salle Barcelona Campus, Ramon Llull University, C/ Quatre Camins 2, 08022 Barcelona, Spain. Tel.: +34 932902430.

E-mail addresses: fonsi@salle.url.edu (D. Fonseca), f.valls@upc.edu (F. Valls), ernesto.redondo@upc.edu (E. Redondo), sergiv@salle.url.edu (S. Villagrasa).

recognize more effective and satisfactory teaching methods, such as: gamification strategies, Project Based Learning (PBL), Scenario Centered Curriculum (SCC), and the recognition of capabilities that provide the non-formal and informal education. The use of IT in learning methods, especially at the level of graduate or post-graduate degrees in frameworks related to Architecture, Urban Planning and Design, or Building Engineering, is defined in the new academic plans. It is important that the student should be able to get competencies and skills related to active and collaborative learning, and digital information management, all of them using roles and PBL exercises. All of these methods are prepared for a quicker and more effective capacitation of the student compared to classic educational methods.

For all these reasons, it is necessary to propose new educational methods that complete the actual PBL and SCC systems, increasing the student motivation, and their involvement and performance. The interest of educators in using these technologies in the teaching process supposes greater engagement and an increase in the students comprehension of content (Kreijns, Acker, Vermeulen, & Buuren, 2013; Roca & Gagné, 2008; Shen, Liu, & Wang, 2013), leading to an improvement in academic results.

Not until recently, research has begun to quantify the huge impacts of informal experiences outside the classroom on motivation and achievement. Architecture, Civil and Urban design education should not be solely located in a closed environment (classrooms), but just the opposite, it should also take place outside the classroom on the streets, squares, etc. (Medeiros, 2011). In these open places knowledge is often built via collaboration, and people act as learners and teachers alike (Bell & et al., 2009). Recognizing that learning occurs across such a wide range of settings can lead to new significance to such simple and everyday actions as a walking to the bus stop, a jog in the park, or even a conversation over dinner, because in all these situations the architecture and/or design is around the student. Given this understanding, landscape architects, civil and building engineers or urban designers have a particularly interesting and exciting responsibility to help the public become interested, informed, and fascinated with their proposals (Scheerens, 2009).

We can affirm that in the last years, more attention has been given to the idea of active participation of communities and individuals (the end-users) in the development of policies, programs or proposals that affect their lives (Foroughi, 2013; Fung & Wright, 2003; Hall & Clover, 2005; Schugurensky, 2004). As will be discussed further in the paper, a successful informal learning space is a topic in need of further research, but especially useful for a student, as in our case, who will be in direct contact with the needs of today's society, and therefore needs to improve his or her training exploring the behavior of end users.

The present study has two main objectives. First, we analyze the implementation process, the difficulties of use, and the degree of students' satisfaction when using an advanced visualization technology with personal mobile devices – we proposed the use of Virtual and Augmented Reality (VR/AR) and Digital Sketching using Hybrid Models (DS/HM). Secondly, we will investigate the informal data from end-users, who have interacted with the 3D student's proposals and will discuss if the proposals of the students have been designed successfully. We will employ a qualitative analysis to obtain the most relevant aspects of the experience that should be improved both in future interactions of students, architects or engineers, and in any new technological implementations within a teaching framework. Analyzing the results of these objectives will lead to a better understanding of how to implement new teaching methods with mobile technologies and how to manage hybrid approaches between formal and informal education in our educational sector.

2. Literature review

2.1. Informal education: citizenship role in architecture, building or urban design

The User eXperience (UX), and the usability of a product or project have been handled normally as tools for testing the quality of every utility or system (Nielsen, 2012). Based on the results that the product obtained of the interaction with end-users, developers get valuable information. This feedback allows a better adjustment, redesigning and improving a system based on the opinion and typology of the end-users. Historically this process has been used in the design of web environments, consumer products such as appliances and all kinds of technology, especially those related to areas such as leisure and social relations (Nielsen, 2000). However we can affirm that it has great potential if adapted appropriately to education, since based on the behavior and emotions of end-users of a proposal, the designers of those (students) may improve in future projects.

Usually most studies are designed in a regulated manner, i.e. within an educational environment and a formal student training. However, in recent decades, there have been studies and research that emphasize the importance of other forms of education away from schools, regardless of the level (Harrop & Turpin, 2013; Jamieson, Dane, & Lippman, 2005; La Belle, 1982). Learning processes are not only confined in regulated areas but also non-formal or informal ways are present throughout a person's lifetime. To do so initially we must clearly differentiate between all types of education currently defined (Coombs, Prosser, & Ahmed, 1973):

- Formal education: Learning typically provided by an education or a training institution, structured and leading to certification. Formal learning is intentional from the learner's perspective: the hierarchically-structured, chronologically-graded 'education system', running from primary school through university and including, in addition to general academic studies, a variety of specialized programs and institution for full-time technical and professional training.
- Non formal: Any organized educational activity outside the established formal system – either operating separately or as an important feature of some broader activity – that is intended to serve identifiable learning users and learning objectives.
- Informal: Learning resulting from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification. In this case, each individual acquires attitudes, values, skills and knowledge from daily experience and the educational influence and resources in his or her environment.

In base of these definitions, the architectural education allows incorporating (in a complementary way) non-formal educational elements, such as specialized courses, as well as informal education. In the education of a future architect or of a similar profession (such as a building engineer, civil engineer, or interior designer), the acquisition of knowledge informally is vital, because the development of a professional project always has a huge influence based on experience. Along this line, one of the great forgotten issues in urban design has been the project perception of the end-users (Fraser & Miss, 2012). This review not only determines the success or failure of a project, but also informally influences the education of both future architects and active professionals (Bilandzic, 2013; Hawkinson, 2013; Rios, 2014).

It would be difficult to compile the number of functional projects based on their design that have become architectural failures

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