Preface

MOTIVATION

Definitely, both technology and new methods are distinctively changing the how and when of teaching practices and learning, at all educational levels. In less than a quarter of a century we have transitioned from almost non-existence of computers in classrooms, to complex networks that allow to both study and work. We have also encountered the consolidation and development of technologies that have transformed –and will continue to transform– our society, such as the Internet and mobile phones. And in the field of education, classical teaching based on lectures is being transformed into new collaborative and experimental methods based on the concept of “learning by doing”. The combination of such determinants as these discussed factors are proving their effectiveness every day, with faster and better assimilation of the skills required at each grade level, and in many cases with improved motivation and satisfaction both of the student and the teacher.

These educational transformations can be seen at all levels of the educational journey. On one hand, kindergarten, elementary, middle and high schools, are increasingly incorporating these teaching methods into a particular project as a guide to learning. Through this project, various topics are taught through additional exercises, with the support of whiteboards, multimedia content and access to computers. This digitization and the use of fairly homogeneous contents has led to several social changes, many of which have gone almost unnoticed: the ongoing disappearance of public libraries and / or concentration on a few content-specific ones, a drastic reduction of physical media such as encyclopedias or dictionaries, the capability of obtaining instant results with minimal effort, and ultimately a greater independence for educating through these new digital resources. We are in a society of “Digital Natives”, expert users of social networks and mobile applications from an early age, a fact that may be very helpful for the educational changes that are occurring.

On the other hand, higher education could be placed into a different context. Due to its intrinsic links between research and teaching, we can say that it is a test bed of changes and innovative educational proposals: online courses and programs; the adaptation of content and classes for mixed purposes, both face-to-face and semi or completely online; using new methods of visualization and virtual reality or augmented reality and its use in professional environments; project-based learning, direct collaborations between academies and industries to improve labor inclusion and the acquisition of collaborative skills; design of new specific laboratories in each educational environment for the formation of specific skills; adaptation of classic courses to massive delivery systems, etc.
Within the described current situation, this manual has been conceived to provide new ideas, methods, and systems that allow ubiquitous work into two major areas such as engineering and architecture. Perhaps due to its educational and professional environment, in the field of engineering is easy to find all types of the already described systems. It is an area with a wide range of publications, books, refereed journals, conferences, etc., which are constantly evolving and outlining new proposals for a teaching that is increasingly less dependent on the physical space of the classroom. The current success of a college education is based on the adaptation of content and workflow to all types of students, from the classroom to blended learning and those who can follow the course from across the world.

However, the world of architecture is a very different field, starting with the different educational systems established throughout the world. While in America, to name a global example, the degree of architecture has great artistic component, in Europe the degree is more focused on technical and conceptual designs of the project. In both cases, project implementation requires collaborative work with a number of engineering fields such as structural design, plant design, construction project monitoring, adaptation to urban areas, etc. In the case of Spain—where we the editors of the Handbook are from—it is a singular degree, where to acquire the skills of the profession it is necessary to pursue a joint degree with an enabling master’s degree in a single structure of 5 + 1 years. This system provides students with competences in the design of structures, facilities design and urban studies, whereas in other countries this would require two degrees: the architecture degree and civil engineering or construction engineering degrees. The inclusion of so many educational content has anchored studies in architecture in a classical system, where most of the teachers are elder, and carries on one hand a very high transfer of knowledge to the students, but on the other, almost no ability for teaching innovation and ubiquitous adaptation of materials, with little or non-existent attempts to migrate content to online training systems.

Our motivations to edit this manual are twofold: on one side lies in the organizational experience of scientific dissemination activities. In this area the publishers account for more than thirty actions as organizers of conferences, workshops, special and invited sessions, as well as co-editors of conference proceedings, special issues in indexed scientific committees and membership of prestigious conferences and journals. Among the most important conferences where they have participated include:

- ACM Multimedia Conference
  - 1st ACM SIGMM international workshop on Media studies and implementations that help improving access to disabled users (MSIADU09), Beijing (China).
  - ACM workshop on User experience in e-learning and augmented technologies in education (UXeLATE ‘12), Nara (Japan).

- ICME
  - Human Factors in Multimedia (HFM 2011) - IEEE International Conference on Multimedia and Expo (ICME 2011), Barcelona (Spain).

- HCI-International
  - Student-centered computing: Technological innovations to improve the motivation and 3D spatial skills of the students. In 1st Learning and Collaboration Technologies Conference, HCI International 2014, Crete (Greece).
Preface

- Open and Social Environments for e-Learning and Education Assessment. In 2nd Learning and Collaboration Technologies Conference, HCI International 2015, Los Angeles, (CA, USA).
- CISTI 2014: Local Organization of the 9th Iberian Conference on Information Systems and Technologies, Barcelona (Spain).

The main contributions on scientific publications (magazines, books, etc.), to note are:

- Guest Editor of different volumes of “Revista Iberoamericana de Sistemas, Cibernética e Informática” and “Journal of Systemics, Cybernetics and Informatics”.
- Co-Editor of different volumes of UbiCC Journal (Ubiquitous Computing and Communication Journal”.
- Scientific Committee Members of different ISI journals:
  - RISTI - Iberian Journal of Information Systems and Technologies
  - UAIS - Universal Access in the Information Society
  - ESWA - Expert Systems With Applications
  - IJEE - International Journal of Engineering Education
  - Arquiteturarevista
  - ACE - Architecture, City and Environment
  - DYNA
  - JUCS - Journal of Universal Computer Science

The other motivation for editing this Handbook, is our interest in performing an action of scientific dissemination of the various experiences gathered during the completion of the project developed from 2012 to 2015. It was made possible by the Fundamental Non-Oriented Research Project of the VI National Plan for Scientific Research, Development and Technological Innovation 2008–2011, Government of Spain, EDU-2012-37247/EDUC, titled: “E-learning 3.0 in the teaching of architecture. Case studies of educational research for the foreseeable future”. This highly innovative project has focused on bringing new teaching strategies in the field of architecture to enable a ubiquitous work and methodologies adapted to the concept of e-learning.

In this regard, it has been decided to extend the range of studies and proposals related to both architectural education and other adjacent courses work: Construction Engineering, Urban Planning or Civil Engineering. Not forgetting any educational field related to engineering studies in general that could be useful in improving ubiquitous teaching experiences. As work objectives we set the selection of a series of chapters that explore new forms of representation, expression and engagement in any educational level, but at the same time can be extrapolated to the main areas of the manual: architecture and engineering.

HOW TO USE THIS HANDBOOK: THE ROADMAP

The 21 chapters of this handbook are classified into four sections according to their contents in the following order:
Preface

1. Generic studies
2. Engineering cases
3. Architecture cases
4. Pre-degree valuable studies

First of all we introduce the chapters’ main contents for each Section.

In the eight chapters of Section 1, basic ideas, concepts and systems on different methodologies used in e-learning, or with the possibility to use in new projects are discussed.

In chapter 1 Franciele Neri de Souza talks about how one of our contemporary society characteristics is that the amount of information available to any individual is enormous, generating problems to manipulate, assess and pick the best of this information. Due to the importance of questioning skills to promote active and reflexive learning and the few studies on questioning profiles in e-learning or b-learning contexts, he proposes the development of curriculum design, and discusses the adequate use of strategies that could be implemented to stimulate student and teacher questioning as well.

Nazareth Álvarez Rosado, Francisco J. García-Peñalvo, Sergio Bravo Martín and Susana Álvarez Rosado, present an application: Join the Board (JTB), which provides shared and collaborative work environments between digital iPhone and iPad devices through a Local Area Network (LAN) over a Wi-Fi connection. Also, improves a new and specific communication protocol to manage the entire communication between devices. The paper shows a full case study that displays the potential of its functionalities.

Nuno Ricardo Oliveira and Lina Morgado in chapter 3 explore the definition around the concept of PLE, its history, the advantages for its use in a lifelong learning process and its importance in the scope of the current research.

Walter Nuninger and Jean-Marie Châtelet, talk about hybridization-based courses consolidated through LMS and PLE leading to a new co-creation of learning. On one hand, how motivation relies on a quick access to data for learners attending a course or during sandwich courses. On the other hand, a greater access to contents leads to a new relation between trainees and trainers. The challenge for accessibility, good education and collective work benefit from the development of innovative solutions; supported by the Higher Education framework in Europe.

Chapter 5 by Adriana Gewerc and Joel Armando studies the theoretical perspectives about new literacies that are dominant in the intellectual field of education at an international scale. The baseline assumption is that this is the primary field in which discourses are produced and then decontextualized as curricular contents in teacher education. Consequently, the identified perspectives and the constructed dimensions of analysis have been used in further stages of research in order to study national and regional curricular documents.

Luca Argenton, Federica Pallavicini, and Fabrizia Mantovani debate serious Games as positive technologies, where Positive Technology is an emergent field whose goal is to investigate how Information and Communication Technologies (ICTs) can be used to empower the quality of personal experience. Their aim is to discuss the role of serious games as a positive technology, analyzing how they can influence both individual and interpersonal experiences by fostering positive emotions, promoting engagement, as well as enhancing social integration and connectedness.

Rocael Hernandez Rizzardini and Christian Gütl, discuss a framework for e-learning 3.0. Web and educational interoperability technologies that have provided initial avenues towards building this type of e-learning 3.0 cloud education environment; however, fundamental challenges remain, such as granular tool resources management, and the lack of use of Semantic Web technologies to leverage automatic
machine-processable tool API. To overcome these issues an holistic model for flexible interoperability is contributed, which contains a semantic definition of tools’ API, an interoperability service framework capable to automatically process APIs, a semantic proxy that enables usage of current APIs, and a system for learning activities orchestration using these tools.

A Case Study in Usability Evaluation of an Online Course by Ana Grasieille Dionísio Corrêa and Valéria Farinazzo Martins present and discuss the implementation of PBL teaching model in Human Computer Interaction (HCI), specifically in teaching usability evaluation of an online course.

In Section 2, the following six chapters describe different systems and proposals that addressed the implementation into the engineering framework.

Motivation on Problem Based Learning by Javier Carmona-Murillo and Juan F. Valenzuela-Valdés, discuss that in order to motivate the students in Problem Based Learning environments, two different strategies are analyzed. The first one consists in introducing two crosscutting issues such as the ecology and the study of patents. The second strategy is to analyze the motivation of students when PBL is combined with different instructional methods, different objectives and in different courses.

Amir Manzoor explains how MOOCs (Massive Open Online Courses) permit learners to access and benefit from the teaching by renowned professors. MOOCs offer an unprecedented opportunity to revitalize education. The chapter reviews the state-of-the-art of MOOCs in engineering education and provides suggestions as to how MOOCs can be effectively utilized for enhancing engineering education.

Martin Ebner, Michael Kopp, Alexei Scerbakov and Kristina Neuböck also discuss MOOCs in Engineering Education. Their work aims to describe first experiences from the implementation of two MOOCs on a newly developed platform. Both courses are related to engineering education: one to physics and one to mechanics.

Fernando Moreira and Maria João Ferreira in their paper “Teaching and Learning Requirement Engineering based on Mobile Devices and Cloud: A Case Study” and in the context of a first cycle course, following the guidelines of courses in Information Systems provided by ACM / AIS, it is proposed the use of Google tools, aligned with Bloom’s taxonomy, to model BML Context Oriented (BML-CO) in a Requirements Engineering (RE) course.

Loc Phuoc Hoang, Phuong Anh Le, Somjit Arch-Int and Ngammij Arch-Int explored the multidimensional assessment method on open-ended question to foster positive attitudes and full effort among students engaging in e-learning environments. The results of the experiment noted that the proposed method surpasses the method that just focuses on student assessment only without consideration and evaluation of the quality of the peer assessment. In light of the findings, the proposed method actively impact on the development and improvement of learning and the quality of peer assessment among students in e-learning environments.

Susan Gwee, Ek Ming Tan, and Mingfong Jan propose to look at the empirical findings that will be useful for instructors, who wish to improve their understanding on how to design an e-learning curriculum that will take into account the different learning needs of their engineering students. In particular, the authors focus on gender issues and how learning in an e-learning curriculum can be designed to engage female students and to improve retention of female engineering students. The authors propose the following change in an engineering e-learning curriculum: mixed-sex groups, use of collaborative activities, blended learning, and communication tools, and mixed-sex curriculum design teams.

In Section 3, three chapters clearly focused to the architecture framework where different solutions are discussed.
Preface

“Learning GIS in Architecture: An Educational Experience to Improve Student ICT Skills” by Pilar García-Almirall, Ernest Redondo and Francesc Valls discuss an educational approach to teach Geographic Information Systems to architecture students in the Barcelona School of Architecture. The methodology uses a combination of theory lectures, worked-out examples with faded guidance using a real-world case of study, and self-directed discovery in a project-based learning activity. The results of pre-course and post-course surveys are also discussed to illustrate the workflow of students when using spatial data, their perception on using GIS applications, and their impressions regarding the development of the course. Finally, the possible reasons for the limited adoption of these tools in the architectural field are also discussed.

Núria Martí Audi, Marta Adroer Puig and David Fonseca debate active learning using digital technology and ubiquitous information in architectural construction. In the discipline of Architectural Construction contact with the professional world is inevitable. With the use of information technologies and communication, ICT and Ubiquitous information ensures the acquisition of skills and knowledge. The programming steps of PBL at the use of ICTs as tools for research-knowledge and representation-communication, achieves another educational dimension, providing students awareness of their own learning, as also a conceptual relationship and ultimately a holistic view of architecture.

Sara Eloy, Miguel Sales Dias, Pedro Faria Lopes and Elisangela Vilar focus their paper on the use and development of new multimedia and computer aided design technologies in both architecture and computer sciences curriculums as well as in multidisciplinary work. The role of technologies such as Immersive Virtual Reality, Augmented Reality, 3D modelling software, design processes and evaluation tools such as shape grammar and space syntax in Architecture curriculums is also discussed.

Finally, in Section 4, we have included four proposals related with high school, secondary and primary levels which show the importance of new digital and e-learning methods that can be used at University level, based on our new digital native students.

Paulo Alves, Luisa Miranda and Carlos Morais, focus on the concept of virtual learning environment (VLE), its characteristics and potentialities. They present the results of a research work conducted with a sample of 347 undergraduates from a Portuguese public higher education institution. The research addressed the issue regarding the use of virtual learning environments within the higher education context and had the following aims: identify the VLE access frequency; assess the influence of users’ computer skills on the VLE access frequency; and assess the importance and impact that students consider the VLE had on supporting the course units they attended.

Mary Leigh Morbey, Farhad Mordechai Sabeti and Michelle Sengara examine the pedagogical implications of adapting the Facebook platform for online collaboration and multimedia learning in blended courses, and offers a model of Facebook implementation for engineering and architecture education. Questions guiding the research ask: What is gained pedagogically through the use of Facebook in higher education courses? What are the pedagogical challenges encountered, and how might these be addressed? Suggestions based on observed trends are offered for the effective inclusion of Facebook as a beneficial pedagogical component in the design of e-learning platforms for higher education.

Asghar Ali Chandio, Zahid Hussain, Muhammad Saleem Vighio and Mehwish Leghari discuss how the rapid development in technology has facilitated human beings in many ways. Tablet Personal Computers (PCs) are one of the new and innovative tools used in education for enhancing learning skills. Their research discussed in the paper has been conducted in five primary schools, where students from preschool to primary three were taught basic lessons using Tablet PC. In this research an application has been developed on the Android platform with an easy to use interface, where the students are able
to perform simple arithmetic calculations and learn the alphabet of the Sindhi and English languages in visual form. During the experiment, it was observed that with visual aids students understood lessons more clearly and easily.

Ana Iglesias Rodríguez and Blanca García-Riaza describe a research carried out to get data about the use that university students make of mobile devices and apps for learning purposes, as most of them use mobile phones and tablets as communication and entertainment tools, but don’t benefit from these devices as educational resources, either due to lack of knowledge or the scarce information about the pedagogical uses of these devices. The methodology followed is based on an analysis of the results obtained from questionnaires filled by the students.

Through the four sections and 21 selected chapters, the aim is to clarify a number of methods and proposals for its implementation, which can be perfectly adapted to all types of education, perhaps being more suitable in those in a more traditional area such as the case of architecture.

TARGET AUDIENCE

The targeted audience for this book is composed of professionals, teachers and researchers working in the fields of e-learning, interactive and enhanced learning, development, implementation, and education.

Teachers, faculty, and leaders in any architectural and engineering studies such as civil design, interior design, building engineering, urban planning, multimedia engineering, etc. Other teachers, human resource managers and trainers of subjects can adapt the content for on-line uses.

For researchers and students in the research fields of education, architecture, engineering, education technologies, instruction design, human–computer interaction, technology enhanced methods, gamification, etc., this book will be a useful reference for their research, work or study.

Designers and developers of e-learning contents and methods can learn and improve their work reading the previous experiences of other colleagues.