Preface

Usability is a key factor in the ability of students to efficiently and effectively acquire knowledge and skills from interactive systems. Human-Computer Interaction (HCI) provides a set of concepts and methodologies that has advanced our understanding and design of interactive systems, especially ones based on computers, devices, and displays. The design of e-learning systems should take into account the characteristics, needs, and abilities of users who interact with virtual learning environments.

As in any virtual environment, the design of e-learning systems should also be focused on the user, usable, and taking into account the characteristics and abilities of users when interacting with the virtual learning environment and educational content. e-Learning should also consider usability, i.e. efficiency, effectiveness, and student satisfaction. Jacob Nielsen defines usability as a quality attribute that sets the usability of user interfaces and is defined by five quality components: learnability, or ability to be learned; efficiency; memorability, or ability to be remembered; to avoid user errors; and user satisfaction.

Directly related to the concept of efficiency referred to usability, the learnability concept appears, and refers, to the speed with which someone learns to use a specific application. Learnability refers to the degree a user interface can be learned effectively and quickly, but can also refer to the efficiency with which a specific e-learning content can be learned. While usability learnability refers to the functionality, learnability also refers to the cognitive process of learning. Thus, the less effort is devoted to understand and learn the functionality of the e-learning system, the more effort you can devote to the educational content where students learn and acquire skills. In designing e-learning systems, it is important to identify both usability and educational goals. Students should be able to easily interact with the educational content and learning environment and focus on acquiring knowledge and skills provided in training. Therefore, the main objective is to identify design solutions e-learning to reduce user frustration and increase the usability, learning, and satisfaction.

In designing usable e-learning systems, it is interesting to consider three dimensions: the student, the content, and the environment. The user or student includes user identification and discovery of their needs and characteristics. The dimension of the educational content includes identifying design guidelines, techniques, and requirements to be followed, and different aspects related to the separation of content and visualization content. This dimension of the learning environment takes into account the identification of the requirements and characteristics of the learning environment, task analysis, and interaction design. These three dimensions help provide a vision complete e-learning showing the importance of usability in e-learning.

In virtual learning environments, it is of great importance to obtain information about user behaviour and understand how students use the learning environment, and how to navigate the educational materials. Understanding user behaviour provides very useful information for usability engineers, and designers
of the system determine whether the interface of e-learning system is designed well and know that tasks generate a higher rate of failure or frustration. The data collected from the student activity is a source of valuable information and relevant to the advances in the design and development of e-learning solutions and innovative tools and services to facilitate achieving the instructional and educational objectives.

Educators are increasingly using sophisticated computer games to snag and hold the interest of the “digital natives” in their classrooms. The aim of educational games is to facilitate the player’s experience, meet desired objectives, and allow users to engage in education while they are enjoying themselves. Educational games seem to put learners in the role of decision maker and give them immediate feedback on their actions and decisions, inviting exploration and experimentation.

Nowadays, techniques and mechanics of videogame design have been applied to enhance non-games applications and services. This emerged concept is called “gamification.” Educational gamification suggests that the use of a game-like rule systems can help students: a) to explore through active experimentation and discovery, b) to help through the mastery process and keep them engaged with potentially difficult tasks, c) to support their motivation and engagement, d) to persist through negative emotional experiences and even transform them into positive, and e) to take on meaningful roles that are fruitful for learning.

Well-designed educational computer games share characteristics with effective e-learning environments, and can also be evaluated and designed using HCI principles. Like the design of e-learning systems and other virtual environments, the design of games must take users into account. For example, elements in playability—including challenge, strategy, pace, balance, control, and progress tracking—occupy a central role in videogame design, attracting users and engaging them in play. While a heuristic may help in design, user testing is essential for measuring success.

In addition, both e-learning systems and games are being transformed as applications and developed for new environments (like virtual immersive learning environments, video-conferencing) and devices (including mobiles and tablets). These technologies may change patterns of interaction and make ubiquitous learning possible.

The purpose of this book is to cover the new models of interaction and HCI paradigms applied to learning environments, focusing on the usability design and evaluation of learning systems and educational game environments. Therefore, this book provides a picture of the state of art in the field of HCI applied to educational environments and serious games, and could help experts of the area of HCI, learning systems, and educational videogames to improve their understanding of student experiences with new learning-gaming environments and allow researchers and developers to share techniques for the design and evaluation of educational games and interactive systems.

This book is divided into three sections. The first section “Usability, Accessibility, and Playability in Virtual Learning Environments and Serious Games,” offers five chapters showing the main principles and techniques about usability, accessibility, and playability in e-learning and educational videogames. The second section, “Human and Social Factors in Game-Based Learning,” consists of four chapters about the study of human factors in serious games, considering the power of attraction, trust, or studying the different aspects linked to users’ collaboration in these environments. The third and final section, “Experiences and Uses of Educational Videogames in Different Contexts,” presents eight case studies providing readers with a rich overview of problems and experiences in the area, such as the design and usability evaluation of educational tools, 3D mobile games, laboratory experiments in CSCL activities, or applications in different contexts and individuals, such as deaf or hospitalized persons. In this way, the book is structured to first introduce the concepts and methods and then show their applications.
through different case studies. In summary, the chapters in this book represent some of the main areas and applications related to student usability in educational software and serious games, illustrating the key benefits and issues emerging through these research projects that share high-quality knowledge with the HCI community.

Carina Soledad González González
University of La Laguna, Spain