Preface

Education is continuously changing due to the integration of new technologies, giving rise to education in a digital age of ubiquitous technologies. Education has made substantial changes to incorporate these technologies into daily teaching. Different types of technologies, such as information communication technology, game-based learning, computer-mediated communication, virtual classrooms, assistive technologies, software and hardware, Internet application, and many more are used to enhance the learning experience in the classroom. These technologies are implemented to help all types of learners, such as students with disabilities, in higher education, and students found all over the world. Educational technology is intended to improve the learning experience for today’s students. Educational Technology Use and Design for Improved Learning Opportunities discusses innovations and applications within the field of educational technology.

The book is organized into 17 chapters. A brief description of each of the chapters can be found in the following paragraphs.

In Chapter 1, “Implementing a Hybrid Cloud Infrastructure to Facilitate ICT in Education: Design and Evaluation,” Yannis Siahos, Iasonas Papanagiotou, Alkis Georgopoulos, Fotis Tsamis, and Lefteris Nikoltsios present the methodology and the results of their effort towards the introduction of cloud services as a means to simplify the adoption of ICT in education using Free/Open Source Software. A hybrid cloud infrastructure is established in order to provide Linux and optionally MS-Windows desktop environments with the Software as a Service cloud model. Legacy and modern school PCs function as stateless devices. To achieve this, their “Sch-scripts” application performs an unattended installation of the Linux Terminal Server Project software to a school computer that also hosts centrally maintained virtual machines. Classroom management is accomplished using their “Epoptes” application. Administration is only required in the school server while the educational software is provided with the Software as a Service model either in online form or through repositories that automate software installation. Four-hundred-twenty schools have already implemented this architecture and 117 responded to the evaluation survey. The statistical analysis of these answers confirms the design principles, which include minimal cost, as well as reusability of obsolete equipment, ease of administration, centralized management, patches and educational software provisioning, classroom management, and above all, facilitation of the educational procedure.

Wei Xu, Ke Zhao, Yatao Li, and Zhezzhen Yi discuss an intelligent tutoring system the authors call FUDAOWANG in “FUDAOWANG: Implementing Advanced Education Concepts to Improve the Tutorial Intelligence of Intelligent Tutoring Systems,” Chapter 2. The intelligence of an intelligent tutoring system is composed of reasoning intelligence and tutorial intelligence. The way to make an intelligent tutoring system with tutorial intelligence is to make sure the system has good tutoring functions. Determining how to provide good tutoring functions is an important research direction of intelligent
tutoring systems. In this study, the authors develop an intelligent tutoring system with good tutoring functions, which they call “FUDAOWANG.” The research domain that FUDAOWANG treats is junior middle school mathematics, which belongs to the objective mature domain. Its characteristic is that the knowledge employed is the mature knowledge accepted by most people. FUDAOWANG uses automatic reasoning technology about objective mature problems to realize its reasoning intelligence. Based on the results of the automatic reasoning, FUDAOWANG synthetically applies the problem-based tutoring and the advanced education concepts to achieve tutoring functions of stepwise, prompt, detailed answers, rethinking after solution, consolidated exercise, etc. The evaluation of FUDAOWANG shows that it is helpful to the students in improving their learning achievements and cultivating good learning habits.

Chapter 3, “PoliCultura and Moodle: The Development of Different Talents in the Inclusion Perspective – A Case Study,” by Chiara Laici, presents the research and professional development results carried out by teachers on the use of educational technologies in the classroom in the course of an experiment based on the Policultura and Moodle didactic format. The training course was designed as an integrated model of presence (laboratory) and online activities, and focuses on the use of LCMS Moodle as a resource for achieving a deeper interaction with both the institutions involved in the projects and with students (and their families) as well as for supporting and disseminating the educational activities carried out in the classroom, with an online environment that would enable the exchange, interaction, and sharing of the study content. The chapter also presents a case study carried out in a classroom taking part in the experiment showing that ICT can enhance different talents in the perspective of school inclusion.

The importance of technologies in disabled patients is discussed in Chapter 4, “Pedagogical-Didactic Training for an Inclusive Didactics: The Precision Teaching for Strengthening of Basic and Integrating Skills in Intellectual.” In recent years, focused studies have highlighted increasingly the importance of using new technologies during the planning of educational and didactic paths to develop skills and functions in disabled patients. They deal with assistive technologies that represent real opportunities of e-participation and social life. They also work as scaffolding in order to promote developing processes for an inclusive didactics. This chapter moves in such direction: about the importance of technologies in mental retardation. This importance turns around the usability of many inputs, which can offer to disabled patients the possibility to exercise their cognitive styles, their own characteristics, and their own autonomies to increase motivation and self-esteem. A didactic application of educational software, based on Precision Teaching method, is proposed in order to: a) verify the effectiveness of this didactic software on learning of integrative skills and b) verify gender differences. For this study, 40 children were selected (20 boys and 20 girls) with and without mental retardation. Results show learning improvements in each group; in spite of students’ difficulties, the use of Precision Teaching seems to have reduced significantly the initial cognitive gap, which refers to the number of correct responses (accuracy) and to response time (fluency) relative to the learning of how to use money. Finally, new perspectives of its pedagogical and rehabilitative application for students with special needs are also discussed.

Enrico Proietti focuses on the educational significance of using the contexts pertaining to archaeology in Chapter 5, “New Technologies as Tools for Education to Cultural Heritage in the EU Agendas: Debates and Plans – The Special Case of Archaeology.” The European Commission faced the subject of educational relation between new media technology and all expressions of culture, aiming at the adoption of pondered policies. The Open Method of Coordination Working Group had the task to study the synergies between education and culture, in particular on the part regarding the new ways of artistic and cultural education provided by new technologies. Given an account of the debate on Media Literacy across Europe, the specific recommendations expressed by the group are shown. The Digital Agenda for Europe is a further step in that direction. Highlighted is the educational application of new
technology to cultural heritage, as a paratextual tool helping in its comprehension. This chapter focuses on the educational significance of using the contexts pertaining to archaeology. The necessary mental application to imagine and reconstruct past exteriorities involves a lot of them, primarily the virtual one with its technology, but much work remains to be done.

Chapter 6, “Computer-Mediated Communication in Primary Education: An Overview and a Research Approach Example,” by Tharrenos Bratitsis and Marina Kandroudi, builds upon a previously published study in the *International Journal of eCollaboration* regarding the exploitation of asynchronous discussions in Primary Education. The originating point of reference was the fact that Computer-Mediated Communication (CMC) tools are being exploited in various sectors, including education. Especially in education, numerous studies can be found in the literature, spanning the past 30 years. Most of these studies concern adult learners in tertiary and continuing education. In addition, approaches regarding secondary education have arisen in the past 10-15 years. Where Primary Education is concerned, only a few CMC-based research applications can exist. This chapter presents all these studies in an attempt to highlight the dynamics of CMC in Primary Education. As established in the literature, communication is directly connected to argumentation, thinking, and consequently, to learning. Moreover, a detailed research study is presented, serving as an example of educational design in Primary School settings, fully utilizing CMC, asynchronous discussions in particular.

D. R. Moore’s Chapter 7, “Conceptual Possibilities and Restraints in Educational Games,” explores arcade-style gaming and its limitations for promoting mastery in the conceptual learning domain. Arcade-style game play is primarily a function of presenting concepts to players and continually requiring them to respond with finer responses. The degree to which a concept is malleable determines how large its range is in game play. In other words, the characteristics of a concept determine its role in game play. The primary purpose of this chapter is to distinguish between two types of concepts: one that is appropriate for arcade-style gaming and another that requires a different, more involved style. Designers of games, particularly of educational games, will find guidance for selecting concepts related to their instructional content.

In Chapter 8, “Bridging Research and Game Development: A Learning Games Design Model for Multi-Game Projects,” Barbara Chamberlin, Jesús Trespalacios, and Rachel Gallagher describe the model as it was used in development of several math games during a four-year development cycle for the *Math Snacks* project. Over the past 20 years, instructional designers in the Learning Games Lab at New Mexico State University have developed a design model for game development that brings researchers, educators, and game developers together throughout the design process. Using this approach, game developers and content experts (a) work collaboratively to ensure educational goals and outcomes are appropriate for the learner and the learning environment, (b) immerse themselves in both content and game design, and (c) test extensively throughout development with members of the target audience. In this chapter, the authors describe the model as it was used in development of several math games during a four-year development cycle for the *Math Snacks* project. They discuss the implications of this approach for the creation of other educational games or suites of games and share recommendations for expansion of the model to other developers.

Specific reference has been made by Rosa Bottino to the notion of perspective in Chapter 9, “Which Perspectives Can Drive the Analysis of Technology-Enhanced Learning Environments?” On the basis of this notion, a framework has been sketched to help make explicit the interplay between perspectives and elements that characterize technology-based learning environments. Such framework has been exemplified considering two research projects carried out at the Institute of Educational Technology of the Italian National Research Council.
Stefania Bocconi looks at the educational resources available for students with disabilities in Chapter 10, “Bridging the Concepts of Educational Software and Assistive Technology.” The chapter aims at defining the boundaries and interconnections between the concepts of assistive technologies and educational software, starting from the consideration that students with disabilities could highly benefit from the adoption of both these categories of tools. Here the question arises of whether educational software products can be considered \textit{per se} as assistive devices or, if not, under which conditions. The chapter explores the matter, with the specific objective of providing teachers and educators with a conceptual key to properly explore the specific databases containing information on the educational available tools and, finally, to find the needed, suitable material for students with disabilities. The creation of the European ETNA portal for assistive technologies represented the occasion for starting the reflections reported in this chapter and for defining a specific methodology for the introduction of educational software in disability-related databases. The ETNA portal itself, whose aims and foundations are also briefly described, coherently instantiates the adopted methodology by referring to the emerging concept that educational software can be considered and adopted as an assistive device for learning, provided that it meets key accessibility requirements and/or that specific practices with disabled students are fully documented and reported.

Chapter 11, “Science, Technology, and Society (STS) Issues: A Survey of Secondary Students in Sana’a, Yemen,” by Mohammed Yousef Mai, Lilia Halim, Ruhizan Mohammed Yaseen, and T. Subahan M. Meerah discusses the results of a survey of secondary school students in Sana’a city regarding Science, Technology, and Society (STS) issues. Firstly, the chapter reviews the literature in order to seek for STS issues that should be infused into the science curriculum in Yemen. Secondly, it reports the results of the survey ranking Science, Technology, and Society issues. A valid and reliable questionnaire containing STS issues is administered to a sample of 418 students from 14 schools in Sana’a city. The results of the study reveal that the most salient issues that must be infused into the science curriculum are human health and disease, water supplies, air pollution, and energy shortages. Comparing the mean scores of males and female students, the results show significant differences in 5 themes. Implications for research and development in science education are discussed.

The purpose of the study by Bruno Lule Yawe in Chapter 12, “Policy Coherence for Development: A Case Study of Uganda’s Primary Education Sub-Sector” is to identify the policy incoherencies as well as research or knowledge gaps relating to Uganda’s primary education. The elimination of school fees at Uganda’s primary education level was accelerated by the 1996 first direct presidential elections. Since the inception of the universal primary education in 1996 and its actual operationalization in 1997, universal primary education is synonymous with primary education. Because school fees were eliminated before infrastructural improvements in the school system had been undertaken, the access shock created by the elimination of fees resulted in a substantial initial decrease in resources available per pupil and a large increase in the pupil-teacher ratio. The purpose of this chapter is to identify the policy incoherencies as well as research or knowledge gaps relating to Uganda’s primary education. Nevertheless, what happens in other sectors outside the education sector has strong implications for the realization of the universal primary education objectives. Uganda’s universal primary education policy is being undermined by policies within the education sector and policies in other sectors. As such, there is need to mainstream universal primary education into all relevant sectoral policies using the Education-In-All-Policies Approach, which would be in the nature of the Health-In-All Policies Approach as well as the Gender-In-All-Policies Approach.
“Virtual World Classrooms: Future Directions for Learning,” Chapter 13, provides a comprehensive case study to demonstrate the longitudinal development of online pedagogy for higher education through a lens of interior design. Susan Martin Meggs, Sharon Kibbe, and Annette Greer present constructivist theory as a guiding pedagogical framework for the creation of learning environments within Second Life (SL) virtual reality. Details of the rigorous process of incorporation of SL, as an enhancement to a traditional course with a laboratory component, is presented to validate the integrity of the scholarship of teaching and learning undertaken in the exemplar case study. The concluding components of the chapter review the iterative process of course outcome evaluation compared to course and accreditation standards to further demonstrate the educational value of virtual reality as an environment for learning.

Chapter 14, “The Extended Body in the Teaching-Learning Process,” by Stefano Di Tore, Paola Aiello, Pio Alfredo Di Tore, and Maurizio Sibilo, focuses on the relationship between technology and education, starting from the consideration that the software design explicitly dedicated to the teaching-learning process is, for the most part, still anchored to a discreet information processing model. This model underestimates the role of the body and corporeality in the teaching and learning process and fails to capitalize on the potential offered by enactive interaction devices already present and widely used in schools and learning-dedicated centers. The opportunities offered by the NUIs in school contexts represent the natural consequence of an embodied and enactive approach to knowledge, valued in school contexts in which the skills of perception and the action are enhanced to foster learning.

“Why Game-Based Learning Did Not Achieve What It Could Achieve: Challenges and Success Factors,” Chapter 15, investigates the reasons behind the attitude differences of professionals involved in Game-Based Learning (GBL). Semi-structured interviews were conducted between October 2009 and March 2010 with 11 Subject Matter Experts (SMEs) and 11 game experts in the UK. The interviews aimed to explain why the professionals’ attitudes were statistically significantly less positive when comparing what GBL could ideally achieve and what it usually achieves. The negative experience encountered by the interviewees is the key reason of the attitude differences. The accountability culture of UK education diminished SMEs’ confidence in GBL practice, and the condition was further impaired with the lack of good quality games. Time constraints, online security for minors, and teachers’ lack of understanding about games were also the challenges faced by the GBL practitioners. Meanwhile, 5 factors of positive GBL practice were identified in the study (i.e. flexibility, use of media-rich resources, positive attitude towards new teaching methods, trendy learning strategies, and maturation of GBL systems). Based on the positive and negative experiences shared by the interviewees, the chapter proposes a guideline for ideal GBL practice, which highlights how successful GBL practice could be replicated and how failed attempts could be avoided.

Chapter 16 by Ramon Morueta presents the results of research in “Adoption of B-Learning at Universities in Spain: The Influence of Environment and Personal Factors” whose main aims are a) to identify the rates of adoption of b-learning through the use of LMS in universities in Spain and b) to check the influence of external and internal factors on teachers in the use of b-learning. A sample was taken of 495 teachers at 4 universities using an ad-hoc questionnaire tested for construct validity. Multiple Correspondence Analysis (MCA) and Structural Equation Modeling (SEM) were used to examine the data. The results fitted Rogers’ Innovation Adoption Model (1995) and corroborated the indirect influence of the environment, the direct influence of self-efficacy and measures to encourage the use of LMS in teaching, as well as certifying the predominance of a range of traditional teaching styles over models of student-based activity.
The authors of Chapter 17, M. Antón-Rodríguez, M. A. Pérez-Juárez, F. J. Díaz-Pernas, M. Martínez-Zarzuela, and D. González-Ortega present two educational Web (PHP and JavaScript) programming validators integrated in the learning management system Moodle to improve the teaching-learning process in “Moodle-Based Validators to Improve Teaching and Learning of Web Development.” These applications also offer the students an appropriate explanation of the errors found and some information about the language key terms, suggest alternatives to possibly misspelled terms, and gather usage data to provide both student and teacher statistical graphics of the type of error committed. The chapter also describes the result of a qualitative analysis of its use in several telecommunications engineering courses offered at the University of Valladolid.

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