

Preface

Research on problem solving and learning has a long tradition in both psychology and education. Cognitive psychologists agree that people have abilities that are essential for processing information and acting successfully in different environments. The nature of human problem solving and learning has been studied by educators and psychologists over the past hundred years. Accordingly, this interesting field of research was always linked with paradigm shifts, e.g. the cognitive revolution. The progress of computer technology has enabled researchers to develop more effective research methodologies and tools for the assessment of problem solving and learning.

This edited volume with selected expanded papers from the CELDA (Cognition and Exploratory Learning in the Digital Age) 2009 Conference (www.celda-conf.org) addresses the main issues concerned with problem solving, evolving learning processes, innovative pedagogies, and technology-based educational applications in the digital age. There have been advances in both cognitive psychology and computing that have affected the educational arena. The convergence of these two disciplines is increasing at a fast pace and affecting academia and professional practice in many ways. Paradigms (such as just-in-time learning, constructivism, student-centered learning and collaborative approaches) have emerged and are being supported by technological advancements such as simulations, virtual reality and multi-agent systems. These developments have created both opportunities and areas of serious concern. Hence, this volume aims to cover both technological as well as pedagogical issues related to these developments.

We organized the papers included in this volume around five themes: (a) instructional design perspectives, (b) cognitive perspectives, (c) assessment perspectives, (d) schooling and teaching perspectives, and (e) virtual environments perspectives. Each of the editors took lead responsibility for reviewing and editing the papers associated with one theme.

In Part I, instructional design perspectives are described and discussed. The authors show how information and communications technology (ICT) tools have completely altered the way museum curators design many of their exhibits and examine the human-computer interaction (HCI) which occurs when people access online museum exhibits (Alwi & McKay, Chapter 2). An ongoing challenge for

academics is the choice of which technologies to use and how to effectively integrate them into the curriculum. Accordingly, a framework for guiding the integration of technologies into curricula is introduced in the second chapter (Gosper, Chapter 3). Further, to support the learning process, the usability concept must be extended to include pedagogical considerations. The importance of pedagogical usability in education has been recognized, but not sufficiently researched. Therefore, the author shows how to foster pedagogically usable Web-based learning objects in school education (Hadjerrouit, Chapter 4). The lack of monitoring and expertise transfer tools involves important dysfunctions in the course organization and therefore dissatisfaction for tutors and students. The authors propose a personalized platform, which gives information to monitor activities and supports the acquisition and transfer of expertise (Michel & Lavoué, Chapter 5).

In Part II, chapters focus on cognitive perspectives of problem solving and learning in the digital age. The authors introduce a tool which basic aim is to construct a semantic knowledge base of concepts and relations among them, in order to analyze free text responses, assess concept maps and provide to users a semantic dictionary of concepts categorized according to the structures of that cognitive model (Blitsas, Grigoriadou, & Mitsis, Chapter 6). A new 1st person approach, singular and plural, to educational research and practice is introduced and compared with the traditional 2nd/3rd-person education (Iran-Nejad & Stewart, Chapter 7). A study which validates a theoretical framework for identifying social and cognitive regulation strategies employed by students during the process of joint construction of meaning in cooperative tasks in a university's virtual learning environment is introduced next (López-Benavides & Alvarez Valdivia, Chapter 8). The last chapter of this part presents the new collaborative cognitive tools (CCT) for shared representations. The cognitive tools make a difference by providing a platform for collaborative construction of the school's information strategy with a shared vision and practice-oriented goals supporting its implementation (Orava & Silander, Chapter 9).

In Part III, new assessment methodologies and tools are introduced. The authors present an attempt to validate a computerized tool as it is used to measure evidence of critical thinking for individual participants in discussion forums (Corich, Kinshuk, & Jeffery, Chapter 10). A new integrated framework for assessing complex problem solving in digital game-based learning in the context of a longitudinal design-based research study is introduced next (Eseryel, Ifenthaler, & Ge, Chapter 11). The concept map based adaptive intelligent knowledge assessment system is described which compares a teacher's and a learner's concept map on the basis of graph patterns and assigns score for a submitted solution (Grundspenkis, Chapter 12). Two case studies are presented which show how technologies support the assessment of complex learning in capstone units (McNeill, Chapter 13). Last, a graph-based approach to help learners with ongoing writing is introduced (Pirnay-Dummer & Ifenthaler, Chapter 14).

In Part IV, schooling and teaching perspectives are described and discussed. The authors compare the impact of electronic performance support and web-based training (Klein & Nguyen, Chapter 15). Concepts and applications for moving beyond teaching and learning into a human development paradigm are introduced next

(Reeb-Gruber, McCuddy, Parisot, & Rossi, Chapter 16). Preparation, experiences, and roles in technology implementation for leaders for the 21st Century are critically reviewed in the following chapter (Schrum, Galizio, English, & Ledesma, Chapter 17). A project which examines the impact of an instruction based on the technology, pedagogy, and content knowledge framework on podcasting and vodcasting for preservice teachers in the United States is presented next (Yamamoto, Chapter 18).

In Part V, chapters focus on virtual environments perspectives. The authors explore the degree to which individual learning styles affect pre-simulation attitudes toward teamwork and post-simulation perceptions of the value of the simulation as a learning experience among third-semester university-level participants in a large-scale telematic simulation (Ekker & Sutherland, Chapter 19). Effects of an online social annotation tool which was implemented in the context of utilizing question-answering tasks with reading documents in order to foster students' cognitive development with higher-order thinking, critical analysis, and development of sophisticated arguments in English writing are reported (Kim, Mendenhall, & Johnson, Chapter 20). The development of self-direction indicators for evaluating the e-learning course using students' self reflections with social software are discussed next (Pata & Merisalo, Chapter 21). The next chapter explores the use of the Internet to connect university students in equivalent classes across international borders, completing collaborative assignments requiring student-student virtual dialog and cross-cultural reflection (Poindexter, Amtmann, & Ferrarini, Chapter 22). Last, the virtual campus project ViCaDiS is introduced which facilitates a shift from Institutional Learning Environments towards Personal Learning Environments (Vasiu & Andone, Chapter 23).

This is the second edited volume to result from a CELDA conference. We are convinced that this work covers the current state of research, methodology, assessment, and technology. When we have so many outstanding papers as were presented in Freiburg, Germany 2008 and Rome, Italy 2009, we will certainly seek to also have future edited volumes, as this benefits the entire professional community.

Freiburg, Germany
Athabasca, AB, Canada
Lisboa, Portugal
Piraeus, Greece
Athens, Georgia

Dirk Ifenthaler
Kinshuk
Pedro Isaías
Demetrios G. Sampson
J. Michael Spector

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Ifenthaler, D.; Spector, M.; Kinshuk; Isaias, P.; Sampson,
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