Preface

MOTIVATION

Fifteen years ago, in 1996, when Internet just emerged in China, I led a subproject of a national key project of the ninth five-year-research plan, “Interactive Teaching and Learning System in Internet” (No. 96-743-01-06-06), sponsored by the Ministry of Science and Technology and the Ministry of Education, China. That was the first time that I officially touched the academic term “interactive learning” and designed and implemented a web-based interactive teaching and learning platform with Microsoft ASP programming language. It contained the learning content for two undergraduate courses, “Computer Fundamentals” and “Field Archaeology,” in multimedia formats, exercises supplying instant feedback, VRML (Virtual Reality Markup Language) objects embedded in the html files for interactive simulating and the assembling of computer components, as well as an instant chatting room for online students and teachers programmed with Java language. Since then I have been interested in the development and research of interactive learning systems. After finishing this subproject I pursued my Ph.D. study in Germany. My dissertation was focused on one of the most important human-computer-interaction modules in computer assisted instruction, i.e., interaction via natural language. Since graduating, I have devoted myself to the further advancement of the CSIEC (Computer Simulation in Educational Communication) project for language learning, which is theoretically based on my Ph.D. dissertation, and other interactive learning systems for primary school, middle school, and higher education.

Apart from the research activities on interactive learning systems, as a university professor, I have also held some seminars for the master and doctor students in Peking University. The daily teaching activities include discussion with the students face-to-face or through Internet, assigning homework to the students, and assessing their homework. Through these activities, I have come to understand interactive learning more profoundly.

Though the term interactive learning nowadays cannot be disconnected with the usage of computer, Internet, or other emerging technology, as I have experienced in the research projects, the learning before the ICT (Information and Communication Technology) age could also be very interactive. A typical example for interactive learning is the legendary Soeratic Method, or elenchus, which remains a type of pedagogy in which a series of questions are asked not only to draw individual answers, but to encourage fundamental insight into the issue at hand. The essence of this method is the interaction between the teacher and the learner or among the learners. This is the definition of interactive learning in the wide or traditional sense. However, this kind of interaction can only happen between the teacher and learner or among the learners either through face-to-face oral discussion, or through homework/exam assigning, writing, and correcting.

Since 1950s and especially in the past 20 years, ICT has provided novel and versatile approaches for interactive learning. First of all, the latest computer technology enables a multimodal and more natural
interaction during learning. The learner can interact with the learning objects not only through keyboard typing and mouse clicking, but also through touching the screen or manipulating virtual equipment with the help of VR (Virtual Reality) technology, and even via natural voice with the help of speech recognition and synthesis technology, as well as other natural language processing technology. Secondly, the Internet, smart phone, and other communication technologies enable the interaction between the learner and learning objects, between the teacher and the learner, or among the learners, who might be located in different places around the world.

The underlying pedagogical theories for interactive learning are constructivism, behaviorism, and cognitivism, etc. For instance, constructivism emphasizes learning by doing, and the interactive learning system can create an appropriate situation for knowledge exploring and constructing. Behaviorism stresses the bidirectional interaction between the external stimuli to the learner and the learner’s response, and the interactive learning system can automatically offer deliberately designed stimuli corresponding to the learner’s input.

With the rapid popularization of ICT in educational institutes, workplaces and household wares, the interactive learning is extensively used in all education stages and training situations, including kid education in family and kindergarten, primary school, junior school, high school, college and university, vocational training, on-job training, special education, and life-long learning. Regarding the different kinds of learning scenarios and learning objects, the course teacher/trainer should design a suitable syllabus with interactive learning technology so that the learners can achieve the best learning performance with the least learning time and cost.

A manuscript covering the interactive learning throughout as many as possible educational stages and situations would be valuable to the researcher, designer, and implementer of this interdisciplinary discipline, as it could provide a panorama of interactive learning from different perspectives. Through search in academic search engines such as “IGI Global” (http://www.igi-global.com), “Google Scholar” (http://scholar.google.com), and “Google Books” (http://book.google.com), only few literatures with the key word “interactive learning” in the title can be found. Moreover, these literatures addressed only one or some aspects of interactive learning. Therefore, I find it very necessary to edit/author and publish such a manuscript about interactive learning in different educational stages.

In June 2010, the worldwide well known disseminator of knowledge, IGI Global, located in Hershey, PA, USA, invited me to submit a proposal for a new edited book on interactive learning, based on my knowledge on topics within the realm of interactive learning. Bearing the above panorama of interactive learning in mind, I wrote a book proposal to the IGI Global. Just two months later, in August 2010, the initial in-house assessment and then the review process of my edited book proposal were completed. The publisher’s external reviewers were very positive about the book proposal and recommended the publication of this book by IGI with the title, Educational Stages and Interactive Learning: From Kindergarten to Workplace Training. Shortly, I received the contract form from the publisher and signed in it. Then the long journey toward the materialization of the book project began.

After three times’ call for book chapters and invitation to potential authors whose expertise is in related fields with interactive learning, I received 45 book chapter proposals and decided to accept 40 of them. After receiving 30 full chapter submissions I invited some Editorial Advisory Board members and other researchers to do the double-blinded review work. As all the full chapter submissions are of high-quality, it was hard to me to make a final decision. At last 27 full chapters were accepted. They are written by 63 authors, who come from 16 different countries and areas. Now with the 27 chapters in hand, I can finally have a glimpse of the shape this manuscript will take.
HOW TO USE THIS BOOK: THE ROADMAP

The 27 chapters of this book are approximately classified into five sections according to their contents:

1. Theory about interactive learning
2. Emerging technologies for interactive learning
3. Interactive learning in preschool and school education
4. Interactive learning in higher education
5. Interactive learning in vocational education, distance education, special education and workplace training

At first I introduce the chapters’ main contents in every Section.

In the four chapters of Section 1, theoretical background about interactive learning is addressed.

John Cowan explains why the traditional instructional approach in higher education has been largely replaced by methods featuring the teacher as an originator or facilitator of interactive and learner-centered learning with higher-level aims in mind, and analyzes some main challenges yet to be confronted effectively in consolidating a sound and comprehensive pedagogical approach to interactive development of higher level educational aims.

Fang-Ying Yang and Cheng-Chieh Chang survey literature review and recent empirical research findings, and propose a web-based interactive learning model to manifest the contributions of learner characteristics on learning. Those characteristics include personal epistemological beliefs, web-based learning beliefs, social cultural beliefs, learning environmental preference, and cognitive load.

To ensure quality interaction in Computer Supported Collaborative Learning (CSCL), Masanori Yamada and Yoshiko Goda discuss three main approaches for social presence: features of communication media; interaction and the learner’s perception of interaction; and learner’s ability integration and refinement. They introduce three steps for both individual and groups to establish social presence: expression, perception and recognition.

Kamran Sedig emphasizes the importance of interface design for interactive learning systems, and states that the interface of any interactive learning system is comprised of two components: representation and interaction. Eight issues should be taken into account for the interface design: four—selecting, coupling, encoding and scaffolding—regarding representation and another four—focus, flow, multiplicity, compositeness and externalization—regarding interaction. Sedig’s chapter introduces every issue in details with a learning system as a case.

In Section 2, the four chapters introduce emerging technologies for interactive learning.

Heng Luo and Jing Lei discuss emerging technologies to facilitate the leaner-content, learner-learner, learner-teacher, and learner-interface interactions. They classified the technologies into four types: educational networking, web-based learning, mobile learning, and interactive classroom equipment. Each type is illustrated with case studies drawn from the literature.

Daniel Novak, Minjuan Wang and Victor Callaghan explain the relation between Augmented Reality (AR) and Virtual Reality (VR), two important human-computer-interaction forms, and described the mixed reality as a spectral approach to AR and VR. They discussed the technologies applied in the mobile AR ecosystem: QR (Quick Response) codes, head-mounted displays, and personal projectors, and their potential usage in mobile education, for example in curation activities.

Narrative can contribute to the realization of constructive interactions within teams and help improve collaborative learning. Giuliana Dettori presents four cases to illustrate how narrative activities can be
set up to meet different learning purposes. In all cases, the narrative activities are mediated by corresponding technological tools, developed or shared fit for the content knowledge, and lead the learners to get actively involved in collaborative activity.

Pedagogical agent can support the human-like and emotional interaction between the learner and learning content. Eliseo Reategui, Leila Maria Araújo dos Santos, and Liane Tarouco carried out an experiment with 179 students enrolled in a distance education course about educational software. The experiment’s results showed that the conversational agent can contribute to the efficiency improvement of instructional conditions, the learning performance improvement, and the individualized learning through social interaction.

In Section 3, five chapters are focused on the interactive learning in preschool and school education. In current digitalized world, the children get in contact with interactive media from a very young time. An Chih Cheng undertook a visual ethnographic approach to understand the social and multi-dimensional nature of media experience of young children aged from three during four-week-long summer camps at a children’s museum in the mid-west, USA. They used smart phones, digital cameras and touch-screen computers in an informal learning environment. The research results demonstrated that children acquire digital media literacy at a very young age, their digital media competency can be considered as cultural capital and reflect their personal and family histories as well as broader social ideology.

The Interactive Whiteboard (IWB) has been widely adopted in primary school and secondary school classrooms. Damian Maher examines the way that IWB supports and extends the interactive nature of learning, explores the three aspects of interactivity: interactivity via the board, interactions around the board and interactivity through the board, and finally concludes that the IWB is a valuable resource to enhance teaching and learning in the primary school classroom if integrated into sound pedagogically planned lessons.

Bruce L. Mann, Henry Schulz, Jianping Cui and Shannon Adams empirically studied two experiments with a talking agent in schools. In Experiment 1 an agent presented 4th and 5th grade students (n = 133) with instruction, practice and feedback on the proper usage of the apostrophe to show singular and plural ownership, and its data demonstrated that modality effects favored speech cueing over text cueing but agent animation had no effect. In Experiment 2 a different agent presented 7th graders (n = 91) with examples and practice questions on multiplying and dividing fractions, and its data demonstrated no effects for modality or agent animation.

Learner-content interaction is fundamental interaction type in computer and web based instruction systems. Jiyou Jia, Yuhao Chen, Zhuhui Ding and Xuemei Cui developed a web-based vocabulary, grammar and listening learning and assessment system for English instruction focused on the learner-content interaction, and integrated it into a normal English class weekly for a term in a high school located in a rural province in China. Through analyzing the student exam scores, the student survey answers, learner-content interaction records in the learning system and their relationship, they reveals that there exists almost significant positive correlation between learner-content interaction and learning performance, but there is not any correlation between the learner-content interaction and learner satisfaction. The survey results demonstrated the learners’ satisfaction with this interactive learning system.

Like bullying in normal life, cyberbullying can also been seen in interactive learning systems for school pupils. Lucy R. Betts and James E. Houston discuss the difference between cyberbullying and traditional bullying, analyze the consequences of experiencing cyberbullying for children’s psychosocial and school adjustment, and suggest strategies to reduce children’s cyberbullying experiences.
Interactive digital storytelling is an important instructional method for children’s education. Marcello Carrozzino, Chiara Evangelista, Veronica Neri, and Massimo Bergamasco undertook a multiple step process of learning with interactive digital storytelling paradigm: story selection, story interpretation and translation of the learning content into images, and finally a corresponding multimedia product realization. They discuss the advantages and limitations of the proposed methodology.

In Section 4, six chapters deal with interactive learning in higher education.

In science and technology disciplines of higher education, many concepts can be simulated by interactive learning systems. Recursion is one difficult concept to be understood by the computer science students. Antonio Pérez-Carrasco and J. Ángel Velázquez-Iturbide identify conceptual models used by teacher to explain the concept and mental models use by students in the learning process. They investigate visualization and animation systems for recursion, compare their technology to support conceptual models and mental models, and review the system evaluation results.

Rui-Ting Huang and Syh-Jong Jang investigated the role of learners’ age, gender, and prior experience difference in online learning satisfaction and continuance intention, and the effect of the perceived interaction on learners’ continuance intention through an empirical study with 122 online learning students from two universities in the southeastern United States. Statistical analysis shows that learners’ perceived usefulness, satisfaction, and learner-learner interaction have a positive effect on their continuance intention, and satisfaction appears to have the most important influence on continuance intention.

Web-based interactive technology facilitates knowledge management practice and knowledge sharing in a learning environment. Based on activity theory, Hsiu-Mei Huang, Shu-Sheng Liaw and Lorna Uden attempt to investigate the predictors of knowledge sharing in the Web-Based Learning (WBL) environment. Empirical research results demonstrate that learners’ self-efficacy and learner autonomy are two predictors to affect learners in constructing knowledge by using WBL, and WBL is an important factor affecting learners’ knowledge sharing.

Interactive learning technology provides effective mediational means to improve practice and learner outcomes to overcome challenges in foreign language education at the tertiary level, such as large class sizes and low student motivation. Jonathan deHaan and Neil H. Johnson enhanced strategic interaction framework by use of digital video and wiki to improve the communication skills of Japanese university students of English. Their research results suggest that wiki, digital video, and strategic interaction-based experiential learning cycles can be effectively integrated to mediate Japanese university EFL students’ oral communication development.

Interactive learning in virtual communities is becoming prevalent in higher education. Constanta-Nicoleta Bodea, Vasile Bodea, Ion G. Roșca, and Radu Ioan Mogos explore the behavior of 129 students enrolled in an online two-year master degree program in project management with interactive learning systems. They used Weka environment to analyze 195 distinct characteristics/variables per student, and apply association rules, clustering and classification to identify behavior patterns and to discover the factors explaining the students’ behavior in virtual communities. Three behavior patterns were discovered for the first and second academic year. The attribute influencing the actual behavior mostly in the first year is the volume of communication with teacher, while for the second year is the volume of materials reading.

Oscar Garcia-Panella, Anna Badia-Corrons, Emiliano Labrador-Ruiz, and David Fonseca-Escudero believe interactive learning has a wide range of similarities to the pleasant gaming experiences, and introduced five similarities in details: as a sense-pleasure experience, as an unfolding story that every student wants to believe in, as an obstacles course, as a social framework, and as an uncharted territory. They present “Media Dome” as a clear example of the place where the interactive learning should occur.
In Section 5, seven chapters mainly handle interactive learning in vocational education, distance education, special education and workplace training.

Shu-Chiao Tsai developed an interactive courseware of English for Specific Purposes (ESP) with a Task-Based Learning (TBL) approach mainly focused on vocabulary, reading and comprehension, and integrated it into a self-study and elective course “English Reading for Technology” offered for sophomore students in the Applied Foreign Languages Department (AFLD) of a vocational university in Taiwan two hours per week for twelve weeks. Statistical analysis shows that most students were satisfied with practices for learning English skills and professional knowledge provided by the courseware, and had a positive attitude toward such ICT instruction.

Danny Glick and Tania Davidson use a nationwide e-learning program of Ministry of Labor in Colombia (SENA) aimed at raising the level of English of over 1.5 million Colombians as a case study to demonstrate how to overcome the challenges in online education: lack of interaction, student isolation and higher dropout rates. The critical factors for this advancement are four types of interactions (Learner-Platform Interaction, Learner-Learner Interaction, Learner-Instructor Interaction and Instructor-Platform Interaction) combined with innovative technological tools and effective pedagogical approaches.

3D virtual classroom provided teaching and learning with engaging, interactive and immersive experiences. Demetrios G Sampson and Pavlos Kallonis designed a 3D Virtual Classroom Simulation for teachers’ continuing professional development based on the “Making the strange familiar” instructional strategy and implemented it using Simulation Linked Object Oriented Dynamic Learning Environment (SLOODLE). This complete virtual classroom contains lecture room, lab room, assessment/quiz room, library room, and classroom management room.

Online learning community facilitates the informal learning through interaction among the learners and between the learner and the teacher, and has become an integrated part of teacher training programs. Eunice Sari and Cher Ping Lim implemented the Online Learning Community (OLC) concept to help teachers in Indonesia with their professional development. They conclude that the programs have uniquely supported the diverse needs of the community member coming from different social and educational backgrounds, and dispersed geographical locations.

David Hawkridge, Alejandro Armellini, Ming Nie, Brenda Cecilia Padilla Rodríguez and Gabi Wittaus claim that Asynchronous Digital Audio (ADA) provides low-cost, high-impact opportunities for interactive learning, and podcasting is a common example of use of ADA in higher distance education and campus education. They present evidence from two cases, one using podcasting, the other voice boards, of embedding ADA into online learning activities to generate effective learner-teacher, learner-learner and learner-content interactions through explicit tasks. In a third case, they present evidence of interactions through implicit tasks.

Sharon M. Kolb and Amy C. Stevens Griffith introduce the Assistive Technology (AT) definition and its discussion through the lens of historical legislation in special education, AT devices, augmentative and alternative communication, AT assessment, and person centered planning as a framework for AT utilization. They conclude that knowledge of the role of AT in the Individual Education Plans (IEP) and familiarity with AT devices can provide informed assessment and instructional planning by practitioners.

Sibel Somyürek examines the major challenges encountered in workplace training and proposes an interactive learning environment model to overcome them. The basis of this proposed Interactive Learning Environment (ILE) model involves the integration of e-learning, knowledge management, and adaptive hypermedia to combine the strengths of each. The integration of e-learning and knowledge management offers learner-centered and problem-based learning experiences, captures organizational memory, constructs communities of practice, and supports employees with job aids.
Though the chapters are sequenced into five sections with Section 1 focused on theoretical aspects of interactive learning and Section 2 focused on emerging technologies, we cannot say that theoretical aspects are not introduced in other sections, and cannot say that technological details are not presented in other sections. In fact in every chapter the authors present the underlying theories directing their research, and also illustrate some concrete technologies in interactive learning systems. Readers who are interested in the preschool and school education can go directly to Section 3, and those who are interested in higher education can jump to Section 4, and those who are interested in vocational education, distance education, special education and workplace training can read Section 5. In other words, almost every practitioner and researcher in education can find his/her specially preferred topics.

Throughout the above book content roadmap, I summarize the features of this book as the following. Starting from the historical and educational point of view, gathering and presenting the latest development and research fruits from the leading experts in the related fields, this book attempts to provide a distinct record of current research and practical application in interactive learning. This book includes almost all aspects of interactive learning, investigates the history, status and future trends of interactive learning, introduces emerging technologies for interactive learning, and analyzes the interactive learning cases in various educational stages and learning situations. Readers interested in the technologies and pedagogical applications of interactive learning will find this book a fresh and comprehensive reference for the understanding of the notions, theories, techniques, and methods related to the research and developments of interactive learning. It is hoped to be a comprehensive reference for the research of interactive learning, and more specifically, will differentiate the interactive learning at different development stages and learning scenarios.

Due to time limitation, some chapters, which I hoped to contain in this book, failed to be found in the chapter proposal and final chapter submissions. They are empirical studies about interactive learning in kindergarten, primary school, special education and workplace training. Certainly it is more difficult to do empirical studies in those educational stages than in higher education, which most of our researchers are working in and very familiar with.

AUDIENCE

The target audience of this book is composed of professionals and researchers working in the fields of interactive learning design, development, implementation, and evaluation.

Teachers, faculty, and leaders in different levels of education institutions: kindergarten, primary school, junior school, and high school, college and university, vocational schools, and special education institutes, can learn how to integrate the interactive learning technologies into the curriculum design properly and effectively.

Human resource managers and trainers in government and cooperate can learn how to use the interactive learning in the on-job training in order to improve the learning efficiency of the recruits or the skilled workers/staff.

For researchers and students in the research fields of education, education technology, instruction design, human-computer interaction, artificial intelligence, computer science, etc., this book will be a wide and insightful reference for their research and study.

Designers and developers of interactive learning software and systems can learn the lessons and experience from other experts and colleagues.