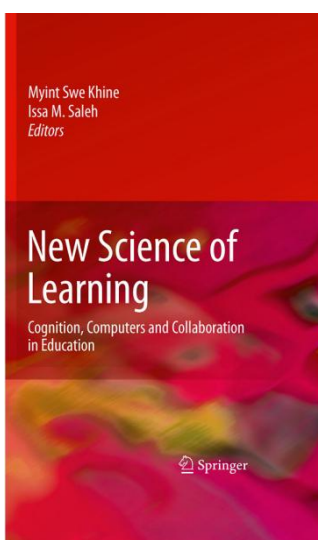


## **NEW SCIENCE OF LEARNING: COGNITION, COMPUTERS AND COLLABORATION IN EDUCATION**

**Myint Swe Khine, Issa M. Saleh (Eds.)2010  
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Information and Communication Technologies (ICTs) have pervaded and changed much of our lives both on individual and societal scales. PCs, notebooks, tablets, cell phones, RSS feeds, emails, podcasts, tweets, social networks are all technologies we are familiar with and we are intensively using them in our daily lives. It is safe to say that our lives are becoming more and more digitized day by day.

We have already invented bunch of terms to refer effects of these technologies on our lives. Digital nomads, grasshopper minds, millennium learners, digital natives, information age, knowledge building, knowledge society, network society are all terms invented to refer societal changes motivated by ICTs. New opportunities provided by ICTs are also shaping skill and quality demands of the next age. Individuals have to match these qualities if they want to earn their rightful places in tomorrow's world. Education is of course the sole light to guide them in their transformation to tomorrow's individual. One question arises however: "are today's educational paradigms and practices ready to confront such a challenge?" There is a coherent and strong opinion among educators that the answer is "NO". "Today's students think and process information fundamentally differently from their predecessors"(Prensky, 2001). And education has to keep pace with these students and their needs. But how? Khine & Saleh managed to gather distinguished colleagues around this question within their book titled "New Science of Learning: Cognition, Computers and Collaboration". The book is composed of 29 chapters within three major topics which are: cognition, computers and collaboration.

The first part of the book focuses on cognitive effects of ICTs and covers chapters one through nine.

**Chapter 1: New Digital Media and Their Potential Cognitive Impact on Youth Learning:** This chapter reports a research driven by a basic question of whether new digital media (NDM) may, or may not, be impacting the way youth think and behave. Qualitative inquiry was employed in this research. Teacher observation reports and narratives

were used for data collection. Results of the research report an overall decline in student attention as compared to preceding generation. Without a question NDM is changing cognitive structures of adolescents and educators have to understand these changes and mechanisms.

**Chapter 2: Group Cognition as a Foundation for the New Science of Learning:** Chapter 2 deals with computer supported collaborative learning environments. Within these environments knowledge is created socially and collaboratively. However, how learning takes place within group work is a question yet to be answered. Group cognition concept can form a foundation for researchers in their way to understand collaborative knowledge creation. Chapter reports a study carried out within small groups of learners.

**Chapter 3: An Embodied/Grounded Cognition Perspective on Educational Technology:** Merely knowing facts and procedures are not enough for understanding. Grounded/embodied cognition claims that understanding is a more complex phenomenon requiring reasoning in a coherent mental model. In this chapter a three level theoretical Embodied/Grounded Cognition framework allowing rich technology integration at all stages is presented.

**Chapter 4: Features of Computerized Multimedia Environments that Support Vicarious Learning Processes:** Vicarious learning is a type of learning as a function of observing. Multimedia environments without any type of interaction (pacing, navigation, questioning etc.) are designed to support vicarious learning. This chapter explores how cognitive activities may be facilitated with the aim of knowledge construction within such environments. Chapter concludes with theoretical and practical suggestions for creating computerized multimedia environments for vicarious learning.

**Chapter 5: Human Memory and the New Science of Learning:** Readers looking for a broad discussion about human memory architecture, components of this architecture and interactions between these components will find this chapter resourceful. Further elaboration on working memory and implications of this architecture like cognitive load, meta-cognition and cognitive learning theory can also be found in this chapter.

**Chapter 6: Meta-cognitive Control of Learning and Remembering:** The term meta-memory refers to study of what people understand of their memory and how they regulate their learning using this knowledge. This chapter deals with increasing individual's self-regulated learning skills using software. Chapter discusses the role of meta-cognition in learning of simple verbal materials.

**Chapter 7: Ethnic Differences on Students' Approaches to Learning: Self-Regulatory Cognitive and Motivational Predictors of Academic Achievement for Latino/a and White College Students:** Is ethnicity a predictor of our academic achievement. In this chapter a theoretical model covering relationships among socio-cultural backgrounds and motivational factors was tested using Structural Equation Model. Findings of this study are important as we are facing students coming from diverse socio-cultural backgrounds both in campus and distance learning.

**Chapter 8: Intuitions, Conceptions and Frameworks: Modeling Student Cognition in Science Learning:** Are we making enough use of conclusions extracted by educational research in our teaching practice? Educational research has obviously extracted great deals information about student learning. This chapter argues that we were not fast enough to apply this knowledge into our teaching.

However cognitive science is offering conceptual tools we can employ to advance our understanding of student's science learning. Consequently that understanding can soon significantly inform our educational practice into science education.

**Chapter 9: An Analysis of Design Strategies for Creating Educational Experiences in Virtual Environments: Can we design e-learning as engaging as video games?**

In this chapter e-learning design strategies are compared to video game design strategies. Chapter presents similarities and differences specific to learning and content management. Conclusions are supposed to improve quality and effectiveness of e-learning design strategies.

The second part of the book focuses on computers and their innovative applications into learning. Part II spans from Chapter 10 to Chapter 19.

**Chapter 10: Redesigning Testing: Operationalizing the New Science of Learning: Not much has changed with testing and assessment methodologies compared to developments in the learning domain. We are still using paper tests, scales, questionnaires etc. for assessment. An innovative framework which is also grounded on recent learning research, and it's applications to apply ICTs into student assessment presented in this chapter.**

**Chapter 11: Self-regulated Learning with MetaTutor: Advancing the Science of Learning with Meta-Cognitive Tools: How can we enhance science learning with meta-cognitive tools? MetaTutor is a hypermedia based meta-cognitive tool aiming to aid learners regulating their learning. Self-regulated learning (SRL) is a complex procedure requiring learners to make a chain of analyzes and decisions. ICTs can prove useful in helping learners with their self-regulation. Chapter covers theoretical and conceptual assumptions of SRL and provides a case study on a biology lesson making use of MetaTutor for SRL.**

**Chapter 12: New Learning—Old Methods? How E-research Might Change Technology-Enhanced Learning Research: Very little development have been observed in technologies and practices of doing learning research compared to dramatic changes in other research fields like physics and pedagogy. Although we are using software tools for our teaching and data analysis, they are not a part of our inquiry approach. In this chapter, affordances of existing and forthcoming technologies to technology enhanced learning topic are elaborated within a four level framework.**

**Chapter 13: Designing Higher Education Courses Using Open Educational Resources: One of the major problems with e-learning today is qualified content development. This chapter argues that we can overcome this problem with partnerships among institutions offering e-learning from different countries. Open educational resources (OER) are used within courses of these partners. These OER are reusable digitised materials offered freely for educators and students for teaching and learning. A framework is presented for OER exchange among these institutions and consequences are discussed. The chapter concludes that use of OER in course design is promising for wider access to flexible global learning.**

**Chapter 14: The Evolution of an Automated Reading Strategy Tutor: From the Classroom to a Game-Enhanced Automated System: Edutainment is one of the major goals software**

developers trying to achieve. The term refers to creating educational software that are also entertaining and engaging.

However recent analyses showed that generally entertainment and engagement aspects of the term emphasized on the design procedures while significantly less effort was given to incorporate learning principles into these software. This chapter points this problem and presents a successful implementation framework for effective and engaging pedagogical software.

**Chapter 15: Experiences in the Field: The Evolution of a Technology-Oriented Teacher Professional Development Model:** When it comes to K12 education there is fact we must consider: not all of teachers are digital natives. Especially experienced teachers possess a vast repertoire of teaching strategies and lesson plans. Nevertheless these repertoires are gathered around old technologies like classroom and textbooks. Without a question, researchers' designing online learning resources, content experts and teachers who are real practitioners of these researchers differing in their conceptions. In this chapter professional development efforts from an 8 year project are presented. Within this project an iteratively refined, technology-focused teacher professional development model was developed. Reader can find stages and iterations of this model in the chapter.

**Chapter 16: A Dialogic Approach to Technology-Enhanced Education for the Global Knowledge Society:** The basic idea behind the knowledge society is that we are in the midst of a new economic revolution in which the nature of work is shifting from the industrial stage dominated by the manufacture and exchange of physical goods towards the post-industrial "knowledge age" dominated by the manufacture and exchange of knowledge and ideas in a global context. This shift however, arises new problems for education. In this chapter a 7C (Critical thinking and doing, creativity, collaboration, cross-cultural understanding, communication, computing, career and learning self reliance) framework driving learners into dialogic intercourses about differences is presented. New communication technologies serve as channels for this framework. Potential of the framework is reflected via case studies.

**Chapter 17: Conceptual Representation Embodied in Hypermedia: An Approach to Promoting Knowledge Co-Construction:** In this chapter organization of hypermedia used as conceptual representations integrating knowledge into a framework consisting of relations among concepts and principles. Using these conceptual representations students' self regulation processes observed within a comparative study.

**Chapter 18: Virtual Worlds for Young People in a Program Context: Lessons from Four Case Studies:** Virtual worlds are one of the major topics gaining attention in education domain. In this chapter experiences from four different studies employing Zora virtual world are presented. Based on the differences in these studies authors provide guidelines for understanding how to design and evaluate intervention programs with virtual worlds for children.

**Chapter 19: New Technologies, Learning Systems, and Communication: Reducing Complexity in the Educational System:** Examining potential impact of new educational environment is one of the major research topics today. In this chapter German N. Luhmann's framework is used as a lens to examine empirical and theoretical research on ICT research.

**The third part of the book focuses on collaboration through technology and their innovative applications into learning. Part spans through Chapter 20 to Chapter 28.**

**Chapter 20: Fostering Higher Levels of Learning Using Diverse Instructional Strategies with Internet Communication Tools: Which instructional methods trigger high level learning most in text based communication environments? High level thinking/learning is one of the most desirable and yet hardly reachable goals in education. In this chapter, instructional methods in text based communication environments are compared in terms of triggering high level learning. Among the compared methods are WebQuests, nominal groups, invited guests, debates and reflective deliberation.**

**Chapter 21: Windows into Teaching and Learning Through Social Annotation Practices: Yet another innovative collaboration application is presented in this chapter. HyLighter is a web based social annotation tool. Learners collaborate as a virtual learning community on highlighter using annotations and comments in a single document or several connected documents. Results and experiences from a conducted study are presented along with further research suggestions.**

**Chapter 22: Orchestrating Learning in a One-to-One Technology Classroom: Mobile devices bring new opportunities for one-to-one classroom activities. However, orchestrating classroom activities emerges as a problem. In this chapter a classroom activity orchestration tool: "SceDer" is presented. The design of the SceDer system has drawn upon a number of domains in order to provide: a pedagogical model for the design of lessons to support individual, group and whole class interactions; an intuitive authoring tool; an intermediate language and exchangeable learning object; a distributed learning environment to support a wide range of learning scenarios; progress, monitoring and control tools to harness learning in the one-to-one classroom. Chapter concludes with experiences gained from a conducted study.**

**Chapter 23: Designing Online Learning Environments for Professional Development: There are several obstacles for sustaining teachers' professional development activities. The emergent capabilities of web based digital technologies can prove beneficial in order to tackle these obstacles. This chapter presents results from a web based professional development course project for certified science teachers in the Michigan, USA. Qualitative methods were employed for evaluation purposes.**

**Chapter 24: Knowledge Building/Knowledge Forum: The Transformation of Classroom Discourse: Meaningful classroom discourse is one of the key factors of classroom learning. General form of classroom discourse is referred as IRE/IRF (Initialization-Response-Evaluation / Initialization - Response - Feedback). Authors examined the form of classroom discourse in ICT enabled collaborative environments. Employed collaboration tools are knowledge forum and video conferencing system.**

**Chapter 25: Digital Video Tools in the Classroom: How to Support Meaningful Collaboration and Critical Advanced Thinking of Students?: How digital video tools in the classroom can support meaningful collaboration and critical thinking skills of learners.**

**In this chapter collaborative visual design is presented as a framework informing development of a constructivist task. Results and experiences from a field study are presented and discussed.**

**Chapter 26: Technology for Classroom Orchestration: Orchestration is an emerging term referring designing and managing multiple classroom activities. Chapter presents 14 orchestration guidelines along with an elaborative discussion.**

**Chapter 27: Knowledge Building in Society 2.0: Challenges and Opportunities: Knowledge-based economies shift the focus from the mastery of knowledge to the creation of knowledge. Knowledge building has been offered as a theory for organizing school education to meet the challenges of the knowledge age. Web 2.0 which emphasizes collective intelligence by supporting participatory, collaborative, and dynamic online learning is suggested to be a technology based knowledge building environment. In this chapter application of web 2.0 technologies into education thoroughly discussed in terms of their affordances and drawbacks.**

**Chapter 28: Innovations in Culturally Based Science Education Through Partnerships and Community: Collaboration should not be treated mere within individual scale. This chapter presents a collaborative research initiative aiming to enhance Native American Children’s science education.**

**Chapter 29: New Science of Learning: Exploring the Future of Education: This chapter contains editor’s concluding remarks.**

**Preparing generations for tomorrow’s conditions is the only goal we are chasing. This goal requires fostering deep learning, maximizing the potential and advancing skills of children. ICTs are emerging as powerful tools with all their affordances for educators. Education society has to foster his understanding into affordances and drawbacks of these powerful tools. Chapters in this book cover innovative applications of ICTs into learning science. I believe this book will give inspiration educators from various domains about innovative ICT uses and new science of learning.**

## **REFENRECES**

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## **BIODATA and CONTACT ADDRESSES of REVIEWER**



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