Preface

Applied Learning Theory and Design is a dynamically evolving interdisciplinary research area examining traditional and emerging educational contexts through diverse conceptual frameworks. Such frameworks include classical learning theory with stimulus-response activities as well as cognitive learning theories and insights from Information and Communication Technologies (ICT). Constructivist epistemology explores patterns in a multitude of learning environments and provides practical design solutions in the form of learner-centered educational environments, while traditional paradigms receive makeovers through applications from postmodern educational theory. Thus, contemporary learning theory now explores the psycho-pedagogical, social and behavioral modalities shaping the design of intellect, energy, and emotion. This triage model describes the role of patterns and meta-patterns for an ecological and sustainable world, hyper-connected through complex professional, educational, social media, and innovative networks composed of real people. Online, flipped, and/or blended learning, Massive Open Online Classrooms (MOOCs), “virtual classrooms”, virtual learning environments and so on provide new forms and modes of learning that enable new roles and digital skills both for teachers and students (as traditionally defined). On a larger scale, educational systems, becoming more open and flexible, must also address emerging challenges for teaching and learning related to globalization, sustainability, and intersecting new demands for cross-curriculum and learner-centered environments.

In this ever-evolving context, teachers, researchers, and professionals in applied learning theory and design need access to the most current knowledge and guidance about trends, methodologies, strategies, technologies, and models. This Handbook of Applied Learning Theory and Design in Modern Education provides comprehensive coverage in this field. This publication, targeted to research, academic, and professional institutions worldwide, will be instrumental for researchers, scholars, students, and professionals in a variety of fields within learning theory and education. These fields include contemporary educational philosophy, university and K-12 pedagogy, educational psychology, knowledge management, pedagogical cybernetics, innovative education, pre-service and in-service teacher education, administration and policy making, social science, humanities, and applied information technologies.

Contributions to this handbook have been provided from scholars and professionals around the world, with sustained research portfolios and expertise in the topics they examine here. They investigate numerous important problems and issues and offer solutions within diverse learning environments. Chapters provide insights and examples related to transforming learning theory and design in relation to 21st century challenges, such as the postmodern crisis in education theory, information overload, increase in data volumes, data in knowledge systems, ubiquity and ever-increasing utilization of ICT in teaching and learning, knowledge pedagogy versus competence pedagogy, and so on. Although the authors use a wide range of theoretical frameworks to explore the issues of applied learning theory in this era of
globalization, each author uses learning theory to explore 21st century needs, analyzing issues, controversies and problems with an eye to evolving relevant solutions. Collectively the chapters allow readers to consider the interdependency of teaching, learning, assessment theories and their practical applications, and how applied learning theory and design in modern education is enacted in various learning environments around the world. The Handbook leads the framing of future discussions of contemporary issues, controversies and problems, exploring how learning theory can enable meeting desired educational outcomes, from early childhood onward, for life-long learning.

THE ORGANIZATION OF THE HANDBOOK

The Handbook of Applied Learning Theory and Design in Modern Education is divided into nine sections, with 41 chapters in all.

Section I, “Learning theory – conceptual frameworks” opens the discussion about how learning theories have been conceptualized since the Enlightenment until the Era of Globalization, exploring applied learning theory and design through innovation and creativity, education for sustainable development, artistic education, and digital pedagogy.

In the first chapter, Gheorghe Rudic synthesizes recent research exploring the impact of globalization on modern education. Rudic argues that informational globalization provides a series of “calls” and “challenges” for educational systems around the world. Thus, he describes the contradictions, paradoxes and conflicts between classical learning theory and learning design requirements. He emphasizes the importance of transitioning from knowledge pedagogy to competency pedagogy; from linear thinking to multidimensional space; from functional literacy to the highest levels of education; and from using computers as technical training aids to learning with computer tools and networking in the framework of postmodernist reconceptualization of education. Thus, the synthetic approach outlines a conceptual framework of the field of modern education and determines the coordinates for rebooting it.

In the second chapter, Elena Railean presents the concepts of “innovation” and “creativity” as two main foci for educational sciences. Railean highlights the importance of the complex metasystems investigation in applied learning theory and design for better affordance of contemporary learner-centered environments. The chapter suggests that online scientific databases provide an effective resource for understanding trends in applied learning theory and design of modern education, particularly for answering the following questions: What is the theoretical basis for innovation and creativity in learning theory and its practical application? How do pre-existing innovation and creative tendencies influence the direction of frontier research related to pedagogy?

In the third chapter, Liz Jackson explores why Education for Sustainable Development (ESD) is an important educational agenda at the international level and the significant implications of ESD for both formal and non-formal education. Furthermore, she elaborates how ESD frameworks have evolved and grown in a number of ways over the last few decades: from an early concern with education for development and environmental education, to critical orientations that focus on the relationship between individual and social factors and between environmental and political factors contributing to challenges for ecological sustainability and global flourishing. In this dynamic field (ESD), priorities may vary with social context, as the critical interrogation of the importance of place in education is considered fundamental to modern ESD frameworks.
Preface

Chapter four, by Vlad Miron Paslaru analyzes main definitions of artistic-aesthetic education theory to elaborate relevant epistemology for art education. This chapter distinguishes between theory and epistemology before examining the significance of these perspectives to enhancing artistic and aesthetic education. This chapter will be of value particularly to art educators and art education researchers.

In chapter five, Michael Vitoulis and Evangelia Laloumi-Vidali approach the concept of “digital pedagogy” by focusing on research on particular conditions of preschool education. The authors provide support and give compelling reasons for broadening the scope of the theory of “digital pedagogy” in early childhood education. They thus look forward toward articulation of traditional pedagogical theories in conjunction with the fundamental principles of “digital pedagogy”. Additionally, they analyze the risks and limitations of giving special attention to digital pedagogy in early childhood education. They conclude by elaborating a conceptual framework for implementing digital pedagogy to enhance the development of early childhood educator.

Section II, “Constructivist theory and networking”, discusses the contributions of constructivism to education in the era of globalization. The first chapter in this section, by Keith Taber, provides an extensive review of how constructivism has been widely adopted as a referent for research, curriculum development and recommended pedagogy in science education. Part of the argument hinges on findings from postmodern philosophy, related to how constructivism has been mooted as a dominant paradigm in the field, and become a major research program over the last few decades. On the other hand, Taber argues that the adoption of constructivism in science education has also been subject to a range of critiques. This chapter thus gives an outline of the developing influence of constructivism in science education, and the common understandings of the term in relation to science teaching and learning. It reports on the main areas where the influence of constructivist thinking has been heavily criticized, and discusses how these criticisms are countered within research.

The second chapter in this section, by Vladimir Nikolaevich Romanenko and Galina Nikitina, extends much of the discussion from the previous chapter related to design issues in the instructional process. As the chapter explores, during learning each student transforms his or her cognitive state from an initial state towards a final one through what Romanenko describes as “effective actions”. Each of the actions represents a set of external impacts. Furthermore, this chapter explores how new technology can be designed in the form of a matrix equation, and analyzed through the lens of a general theory of learning technologies. The effectiveness of an instructional process based on mathematical descriptions is thus argued.

Chapter three, written by Matin Saad Abdulllah and Al-Sakib Khan Pathan, presents an adaptive and intelligent model for online learning of Qur’anic Arabic. The goal of this model is to make the learning process easier by extracting frequently used words and collocation in the Qur’an with different contextual connotations, and then applying an online periodic reminding system. As the authors highlight, this model makes the learning process easier. Though the chapter emphasizes the particular case of online Qur’anic Arabic learning, implications of this case can be of significance to educators across world regions and contexts, language groups, and disciplines.

The next chapter, by Eugene de Silva and Eugenie de Silva, discusses the systemic tracking approach to syllabus analysis, nicknamed in shorthand as the START model. The author explains the novelty of this method for educators aiming to heighten current academic standards while simultaneously prioritizing multidisciplinary approaches. Practical implications of the START model are also given in this chapter.

Galyna Nesterenko in the next chapter focuses on self-organization teaching technology as one of the best instruments for generating, developing and using innovative methods in education. It is argued in
this chapter that through the process of the spontaneous and dynamic motion of components of a socio-system, self-organization can randomly generate new (often attractive) structures, processes and situations. Moreover, self-organization of a student group can generate new techniques and ideas for learning that also increases students’ motivation to learn and interest in a discipline, and encourages teachers’ professional development and deeper understanding of a subject matter and pedagogical techniques. Several key approaches to initiate self-organization of a group of students or teachers are given in the chapter.

In the first chapter of Section III, “Cognitive theories, models and practical applications”, Aneta Mechi and Margarita Sanchez-Mazas present an alternative way of considering teaching in classical educational methodologies. For this, the authors define the Cross-Domain Educational Situations (CDESs) model, which is based on the Social Cognitive Flexibility (SCF) approach (attitude and competence). The SCF approach allows educators to understand the relationship between the teachers’ zone of action, epistemic inclusion, and feeling-of-being-concerned, to provide teachers with effective, tested, and concrete tools. A training SCF program for future teachers is presented, as well as some avenues for research.

In the second chapter, Gabriela Walker and Elizabeth Pattison, explore Bronfenbrenner’s Ecological Framework of Support Systems for Education and Special Education. In this chapter, the authors review the principles of Bronfenbrenner’s Ecological Theory through a series of novel frameworks that can be practically applied to students’ lives and experiences outside the classroom environment.

These ideas are continued by Marcia Hakansson Lindqvist, who presents new possibilities and challenges in digital learning environments. First the author describes the results of a one-to-one laptop initiative in Sweden using the Ecology of Resources Model and the analytical concept of filters. Examining evaluative data gained through surveys and interviews, she concludes that the manner of school leadership support for the uptake and use of digital technologies in classrooms will have implications for sustaining school change as well as the work towards modernizing and digitalizing learning environments.

The next chapter in this section, by Martin Timothy Hall and Jason E. Marshall, focuses on the importance of fostering motivation among students across diverse modern educational spaces, such as gifted classrooms, inclusive settings, and technology-assisted teaching spaces. Three basic psychological needs, namely, competence, autonomy and relatedness, are explicated as catalysts for promoting and maintaining intrinsic motivation in modern education.

Section IV, “Open education, open pedagogy and open access”, deals with new roles for teachers and students in learning environments, novel pedagogy, innovative models and methodologies. In the first chapter in this section, Masha Etkind, Ron Kenett and Uri Shafrir propose a novel pedagogy that enhances higher-order thinking. As the authors emphasize, the evolution of instructional methodology follows insights from four recent developments: development of digital cyber-infrastructure of networked information; research in neuroscience and brain imaging, showing that exposure of learners to multisemiotic inductive problems enhances cognitive control of inter-hemispheric attention processing in the lateral brain and increases higher-order thinking; research in evolutionary dynamics on peer cooperation; and indirect reciprocity that documents the motivational effect of knowledge of being observed, a psychological imperative that motivates individuals to cooperate and contribute to the common good. The authors argue for the importance of deepening student comprehension of conceptual content for the improvement of learning outcomes, and connect priorities to a particularly theorized framing of higher-order thinking.

The second chapter in this section, by Uri Shafrir and Ron Kenett, presents the Concept Science Evidence-Based MERLO Learning Analytics, an educational informatics system based on teaching and learning methodologies. The chapter collects, documents, analyzes, and reports data gathered from
Preface

implementation of a pedagogy for conceptual thinking and peer cooperation in elementary, secondary, and post-secondary educational institutions, as well as from learning programs in private and public organizations. The development and background to this system are described, as well as the significant possibilities it raises for modern educational theory and practice across a wide variety of domains.

In the next chapter Luke Bassuener describes the ideas of open access and of libraries as sources of self-directed learning for acquiring knowledge. Historically and looking toward the future, this chapter gives an overview of how libraries continue to be significant while they change in structure in significant ways. The author argues that libraries and open access function in a variety of ways to make information freely available to the public, but the current era of market-driven globalization has reshaped the economic environment, and threatens to undermine their principle mission. The defining characteristic of this threat is the treatment of knowledge as a commodity. The idea of open access and the institution of the library exist as sources of self-directed learning and as representatives of the shrinking commons in the face of encroaching market forces. Libraries face challenges of relevance in regard to technology, budgets, privatization, and physical space. Open access must find ways to define itself coherently, as publishers, researchers, libraries and businesses all try to manipulate the concept to fit their needs.

In chapter four, by Syh-Jong Jang and Meng-Fang Tsai, the importance and possibility of models of Self-Regulated Learning (SRL) skills and Technological Pedagogical and Content Knowledge (TPACK) in current educational studies are articulated. As the authors note, most SRL studies have highlighted the relationship between self-regulation and academic performance. Moreover, pre-service teachers’ development of TPACK with appropriate Information and Communication Technologies using cognitive stimulation tools is examined on the basis of results from a statistical analysis of data.

The final chapter in this section, by Liguo Yu and Raman Adaikkalavan, deals with problem-based learning in a software engineering classroom to develop soft skills related to communication, documentation, team working, and interpersonal relations. In this chapter, case studies are explored that analyze the experiences of two instructors with similar teaching approaches. This chapter shows that while problem-based learning is promising in engaging students and effectively delivering soft skills, it is more challenging for instructors. Compared to traditional instructor-centered learning approaches, problem-based learning requires more effort in problem design, refinement, student coaching, performance evaluation, data gathering, and experience analysis.

Section V, titled “Design of new learning environments”, addresses the design and practical development of innovative learning design models. In the first chapter, Valérie Tartas and Marcelo Giglio, present a conceptualization of an optimal learning model as a way for teachers and students to participate together in discursive activities to elaborate new innovative ideas. The authors argue that collaborative settings offer an exemplary context to promote learning in the classroom. They additionally describe case-study examples of teacher’s guidance within peer collaborative sessions for the co-construction of the common goals and meanings. The educational contexts discussed in this chapter are science and music, as well as interdisciplinary environments.

The second chapter in this section, by Becky Boesch, Candyce Reynolds and Judith Patton, explores the idea of digital technologies with the example of ePortfolios. The authors elaborate how ePortfolios are an effective way to deepen integrative learning and facilitate more authentic assessment for courses, programs and institutions. The challenges of implementing ePortfolio assessment across educational contexts are also considered.

New possibilities for educational experience with dynamic electronic textbooks are described in the fourth chapter in this section, by Amir Manzoor. The chapter examines potential implications of con-
temporary learning theory to innovative methodology for digital textbook design. Manzoor argues that
the academic publishing industry must deliberately respond to growing demand for digital textbooks.
Educational outcomes of electronic textbooks are also critically investigated and analyzed.

The next chapter of this section, by Donna Farland-Smith, provides a description of validity and
use of the modified Draw-A-Scientist Test (mDAST) and the Attitude toward Science Survey (ATS).
In this context Farland-Smith describes how students’ attitudes toward science continue to decline, and
concludes by making recommendations for improving attitudes toward science in light of the findings
of her research.

The final chapter, by Martha Ann Davis McGaw, presents learning-centered education as a histori-
cal concept with roots dating back to the progressive educational movement of the early 1900s. The
authors explore in relation how the major focus of applied learning theory in post-modern education
entails preparing learners for a profession, a basis for achieving economic independence and knowing
methodologies, best practices, and challenges.

Section VI, “Technology for learning”, presents the ideas of applied learning theory and design of
technology enhanced learning environments. It deals with issues of technology-enabled learning envi-
ronments, technology usage opportunities in the inverted classroom, virtual activities to promote mul-
ticulturalism and sustainability of international partnerships, using theory based research in supporting
creative learning environment for young children, and innovative pedagogical models. The first chapter
is by Amir Manzoor, and analyzes the role of students and student interaction in technology-enabled
learning environments.

The second chapter in this section, by Joslenne Pena, Patrick Shih and Mary Beth Rosson, analyses
technology usage opportunities in the inverted classroom (flipped learning). It first describes in detail
an understanding of the inverted (flipped) classroom and current practices. The authors then propose
that instructors become end-user developers: in other words, content creators and designers of technol-
ogy usage in the inverted classroom. As the authors elaborate, several challenges can arise when using
this teaching approach, related to resources, costs, time constraints, and the process of learning new
technology. The authors develop critical understanding of the value and benefits of flipped learning in
this context, and describe the best practices from the technologically-borrowed and applied perspective
of “end-user developers”.

In the next chapter, Jiyoon Yoon and Insoon Han report on the effects of virtual activities for promot-
ing diversity, multiculturalism and sustaining international partnerships in science teacher education.
Though students rather than teachers are often the subject of investigations into technology in modern
education, this research into science teacher education reveals how virtual activities enable teachers to
engage in a variety of innovative practices that enhance their professional development.

In the fourth chapter in this section, Amanda Muhammad, Gloysis Mayers and Deborah Wooldridge
describe a supportive creative environment for young children as an essential element toward facilitat-
ing creative thinking. They note that creativity requires imagination, insight, problem solving, divergent
thinking, and the ability to express emotions and make choices. It is argued that such skills can be facili-
tated through a supportive learning environment for three to four year-olds. This chapter also discusses
creativity theory in terms of its practical application to the early childhood educational setting. The
authors elaborate with reference to the Reggio Approach for creativity-provoking methods and practical
application related to curriculum, arranged indoor and outdoor spaces, problem-solving strategies, and
educational games.
This section’s final chapter, by Christine Schulz, investigates conceptual issues for the development of a new pedagogical model to better ensure active and transformative learning based on authentic experience of young people through applied learning programs. This chapter unfolds a framework for conceptualizing applied learning programs while distinguishing between authentic and inauthentic educational experiences for young people. The chapter draws on research data to provide an applied-learning pedagogical model for individual practice.

Section VII, “Innovative approaches, systems and tools for learning”, analyses major issues in applied learning theory and design and related potential solutions, discussing the Adaptable Learning Theory Framework for Technology Enhanced Learning, Augmented Reality as a New Media for Supporting Mobile-Learning, assessment tools, and Karen Education. In the first chapter in this section, Byron Havard, Marlene East, Lakshmi Prayaga and Alex Whiteside present an overview of the educational potential of major recent technological innovations. Developing a framework that connects technological innovations particularly with postmodernist learning theory, the authors scaffold the construction of a useful guide to educators grappling with how to align interrelated components of effective instruction when using educational technologies.

The next chapter, by Mauro Figueiredo, José Gomes, Cristina Gomes, Rui Gaspar and João Lopes, argues for the importance of using mobile technologies with Augmented Reality (AR) in relation to the ubiquity of these and other interrelated technologies in everyday life. The educational implications of the new ubiquity of AR technologies, including challenges, limitations, and possibilities for future impact are discussed here.

The third chapter of this section, by Dimos Triantis and Errikos-Chaim Ventouras, explores the Paired Multiple Choice Questionnaire (PMcQ) as a novel assessment tool for modern education. The authors discuss the background of PMcQ within education, before elaborating on use cases for enhancing education.

In chapter four, Chaitut Roungchai provides a case study of learning inclusion in Thailand. As learning inclusion is a significant global educational issue today, the case study presented in this chapter is explored for its educational implications beyond Thailand and Asia, highlighting aspects of learning inclusion often neglected with the use of alternative educational research methods.

Section VIII, “Media literacy and artistic education”, discusses the issues, controversies and solutions for innovative educational methodologies. This section analyses methods of collaborative design, citizenship education, artistic education and paired placements. The flipped classroom is examined in the first chapter in this section, by Donna Farland-Smith, but in this case with regard for home-schooled students. How home-schooled students can benefit from the lessons of the flipped classroom will be of interest to educators seeking alternative conceptualizations of the classroom beyond the traditional formal school setting.

The next chapter in this section, by Marina Morari, analyses the diverse fields that constitute much of artistic education, elaborating on education about literature, music, theatre, visual arts, and choreography. Morari articulates these fields here in relation to contemporary educational processes. The element of innovation in artistic fields is represented by the development of benchmarks for methodological integration of artistic education areas in general education.

The third chapter in this section explores the changing attitudes and behaviors of entitlement among youth in the modern day United States. The author, Marian Evelyn Irwin, examines methods for educators to combat this character-threatening mentality to develop more accountable and empathetic young people regardless of grade level, race, socio-economic status, and other characteristics.
The final chapter in this section, by Jeanine Jechura and Cynthia Diane Bertelsen, conceptualizes perceptions of teacher candidates in paired placements. The authors use qualitative inquiry to describe the nature of paired placements within a revolutionary new teacher education program designed to prepare undergraduate teacher education candidates for employment in inclusive early-childhood learning environments. The challenges and opportunities are discussed for teacher education in relation to this research.

Section IX, “Semantic e-learning theory, security and plagiarism”, develops a broad understanding of semantics and pragmatics in mathematical events, the roles of e-Learning, organizational learning, and knowledge management, cyberinfrastructure for personalized education, and strategies and technologies for preventing plagiarism in higher education. The first chapter in this section, by Vinod Kumar Kanvaria, examines semantics and pragmatics in mathematical events from a linguistics point of view. The educational implications of utilizing this theoretical perspective in mathematical education are analyzed.

In the second chapter, Kijpokin Kasemsap presents the roles of e-learning, organizational learning, and knowledge management in learning organizations. The author demonstrates how using such concepts effectively can lead to improved organizational success in the digital age, given their relevance particularly for learning organizations that seek to serve practitioners and researchers, increase business performance, sustain competitiveness and fulfill set goals. The chapter argues overall that through applying tools from e-learning, organizational learning and knowledge management, communities have the potential to enhance performance and achieve strategic goals.

The third chapter in this section is titled “Cyberinfrastructure, information security and plagiarism”. In this chapter, Tyler Morrow, Sahra Sedigh Sarvestani and Ali Hurson investigate pervasive cyberinfrastructure for personalized education today. The authors argue that within modern educational theory, which incorporates an amalgamation of different learning and pedagogical theories, it is important to initiate a discussion about utilizing pervasive cyberinfrastructure.

In the final chapter of the handbook Anton Dolzhenko, Tahir Mehmood Khan and Anna Dolzhenko describe the risks of plagiarism for higher education and a new tool for detection of plagiarism. As the authors highlight, plagiarism has evolved and in many ways been facilitated by the advancement of technology. As this chapter makes clear, developing effective and appropriate methods for detecting and preventing plagiarism in the future is important for a wide variety of educators and educational environments today.

CONCLUSION

Through the contributions of this set of international researchers and practitioners, this handbook aims to help readers better understand the breadth and depth of issues, controversies, problems, and resolutions in applied learning theory and design in modern education. It can help enable decision making with up-to-date knowledge of the state of learning theories, pedagogical resources, and knowledge management systems, with awareness of effective educational techniques for developing and fostering 21st century competencies. Such knowledge and awareness is more crucial now than ever before, as global challenges impact all educational systems and redefine local community needs related to cognition, metacognition, learning environments and educational outcomes, teaching, learning and assessment processes, what it means to “know”, and the types of knowledge required for adaptation to global learning environments. As the roles and attributes of the teacher, learner and institution have been changing radically, learning environments place students in active roles in using digital learning technologies, such as using and
Preface

assembling their own digital textbooks. As education is being revolutionized in the 21st century, this handbook will be an essential resource for anyone interested in navigating the new technologically enhanced learning landscape through the critical juxtaposition of emerging knowledge across disciplines in learning theory and modern education.

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