

Preface

Digital Knowledge Maps in Education offers readers chapters that address, theory, research, and practical issues related to the use of digital knowledge maps in all aspects of education and draws predominantly on international perspectives.

Digital knowledge maps have generated much attention and interest among education practitioners and researchers over the last few years. Education institutions around the world are investing heavily into new technologies to provide online spaces within which to build resources and conduct activities. One of these spaces is digital knowledge maps with their power being “at a glance” visual representations that enable enriching, imaginative and transformative ways for teaching and learning, with the potential to enhance outcomes.

This edited volume seeks to provide a collection of knowledge mapping research and theoretical currents across a number of different perspectives with contributors who are both leading authorities and new voices from a wide geographical spread and from a variety of discipline backgrounds. It is intended as an introduction to those new in the field and interested in designing knowledge mapping projects but also an inspiration for seasoned knowledge mapping researchers as it presents recognised practices, exemplifies most recent methods and techniques as well as emerging trends and debates. While coherence is pursued, the editors deliberately choose to reflect the empirical, theoretical and methodological diversity commonly found in this rapidly growing field.

We organised the chapters included in this edited volume into four major parts: (I) digital knowledge maps in open, distance, and flexible learning contexts, (II) digital knowledge maps in collaborative learning contexts, (III) advances in assessment using digital knowledge maps, and (IV) case studies investigating digital knowledge maps.

In Part I, the six chapters address theoretical foundations and current issues using digital knowledge maps in education. Chapter 1 positions knowledge mapping in educational context but also in online environments. It provides an introduction to mapping for readers unfamiliar with the research field of mapping with a succinct yet comprehensive understanding of the relevant terminology, definition,

techniques, software catalogue and research literature (Ria Hanewald and Dirk Ifenthaler, Chap. 1). Chapter 2 attempts to make sense of knowledge integration maps. It introduces Knowledge Integration Map (KIM) as a new form of digital knowledge map that aims to triangulate changes in learners' conceptual understanding through a multilevel analysis strategy that employs a combination of quantitative and qualitative methodologies (Beat Schwendimann, Chap. 2). A literature review on digital knowledge maps for comprehension and learning from hypertexts is provided in Chap. 3. The authors offer an overview of hypertext that help readers' navigation while distilling conditions under which concept maps are most effective and point out some educational implications (Franck Amadiou and Ladislao Salmerón, Chap. 3). Next, the use of digital knowledge maps for supporting tutors especially in their capacities to give effective explanations is emphasised. The authors present, describe and then test an approach that uses knowledge mapping to analyze instructional explanations in order to improve their effectiveness. The theoretical conception of the new method was then tested in a series of experiments to determine the validity of the measure (Andreas Lachner and Matthias Nückles, Chap. 4). The next chapter investigates pre-service teachers' thinking progression about e-Learning and its integration into teaching through concept mapping. It is based on a case study of nine undergraduate students in a pre-service teacher course engaged in e-Learning (Wan Ng, Chap. 5). The final chapter of this part shows how to raise teachers' awareness of the potential benefits of knowledge mapping and to introduce them to powerful, free software for their classrooms (Scott R. Garrigan, Chap. 6).

In Part II, the five chapters focus on the use of digital knowledge maps in collaborative learning contexts. In the first chapter of this part, the author seeks to improve ESL Learner's reading skills through collaborative work with digital knowledge maps (Pei-Lin Liu, Chap. 7). The next contribution reports research of digital knowledge mapping in individual and collaborative learning in primary school students specifically in science education (Andreanna K. Koufou, Marida I. Ergazaki, Vassilis I. Komis, and Vassiliki P. Zogza, Chap. 8). An essay towards a cultural-historical theory of knowledge mapping, specifically collaboration and activity in the zone of proximal development is presented (John Cripps Clark, Chap. 9). The use of digital knowledge maps within a Science Communication course taught at an Australian University with the view of increasing learning outcomes in future years is presented next. The chapter explores the impact and extent of the students' learning, especially their prior knowledge, their attitude about working collaboratively in small groups, their perspective on using technology-rich learning in general and using digital knowledge map in particular (Ria Hanewald and Dirk Ifenthaler, Chap. 10). The last chapter in this part describes the use of knowledge maps to foster peer collaboration in higher education. The authors combine Novakian concept maps and hierarchical reductionism methods to create a new pedagogical approach (Paulo Correia, Camila Cicuto, and Joana Aguiar, Chap. 11).

In Part III, the five chapters address advances in assessment using digital knowledge maps. The first chapter presents evidence that digital knowledge maps do indeed meet the criteria deemed necessary for effective formative assessment—they

validly assess higher-order knowledge, identify specific conceptual strengths and weaknesses of students, provide feedback that can be used to effectively improve learning, and can be user friendly for both students and teachers (David L. Trumpower, Mehmet Filiz, and Gul Shahzad Sarwar, Chap. 12). Next, a method to capture and analyze differences in students' action sequences while creating a knowledge map is introduced (Allan Jeong, Chap. 13). Automatically generated knowledge maps that aggregate expertise from several domains to foster a common understanding is proposed in the next chapter. The function and use of the knowledge map was illustrated with the example of team meetings in companies and the potential miscommunication that may result in loss of productivity and outcomes, which application of the mapping approach can help to overcome or at least reduce (Pablo Pirnay-Dummer, Chap. 14). Next, the problem of using digital knowledge maps for formative assessment not only in university settings but also for primary and secondary school students is addressed (Heiko Krabbe, Chap. 15). The final chapter of this part sees digital knowledge maps as the foundation for learning analytics through instructional games. It reports on an assessment instrument and uses an illustrative case of gameplay behavior to show how digital knowledge maps can teach and assess game-based environments (Debbie Denise Reese, Chap. 16).

In Part IV, three case studies investigating the instructional practicability of digital knowledge maps are presented. The first chapter of this part positions digital knowledge mapping as an instructional strategy to enhance knowledge convergence and thus examine knowledge maps as an instructional tool (Darryl C. Draper and Robert F. Amason, Jr., Chap. 17). The next case study uses knowledge maps as a teaching tool for financial literacy with the task for students being the construction of individual maps that reflect their assets and debts in order to capture and develop their financial competency and track private consumption and money management (Daniela Barry, Nina Bender, Klaus Breuer, and Dirk Ifenthaler, Chap. 18). The final case study explores the views of four academics from different disciplines in using digital knowledge mapping for the first time with their students (Gregory MacKinnon, Rohan Bailey, Patricia Livingston, Vernon Provencal, and Jon Saklofske, Chap. 19).

Clearly, the field of digital knowledge mapping is a dynamic one, particularly in the context of new and emerging technologies and this book gives a sense of the creative possibilities in using digital knowledge maps and highlights current trends and future directions for educators and instructional designers.

Melbourne, VIC, Australia
Trolak, Malaysia

Dirk Ifenthaler
Ria Hanewald

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