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IFIP was founded in 1960 under the auspices of UNESCO, following the first World Computer Congress held in Paris the previous year. A federation for societies working in information processing, IFIP's aim is two-fold: to support information processing in the countries of its members and to encourage technology transfer to developing nations. As its mission statement clearly states:

> *IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.*

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

IFIP distinguishes three types of institutional membership: Country Representative Members, Members at Large, and Associate Members. The type of organization that can apply for membership is a wide variety and includes national or international societies of individual computer scientists/ICT professionals, associations or federations of such societies, government institutions/government related organizations, national or international research institutes or consortia, universities, academies of sciences, companies, national or international associations or federations of companies.

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# Digital Transformation of Education and Learning - Past, Present and Future

IFIP TC 3 Open Conference on Computers in Education, OCCE 2021
Tampere, Finland, August 17–20, 2021
Proceedings

Springer

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# Preface

This volume contains selected papers from the Open Conference on Computers in Education (OCCE 2021), organized by Working Group (WG) 3.4 of the IFIP Technical Committee 3: Education (TC3) and supported by its other working groups. The conference was run as a hybrid conference, and this event pioneered this form of practice for IFIP and TC3. The online facilities were all run from the host organization, and the onsite element was held in Tampere, Finland, from August 17–20, 2021, hosted and supported by the University of Tampere. The conference was open to researchers, policy makers, educators, and practitioners worldwide. The conference title, which was also selected as the book title, Digital Transformation of Education and Learning – Past, Present and Future, reflects the ongoing commitment to (and current interests in) research and practice in learning and technology that members of TC3 and its working groups have fostered over many years, and continue to nurture today. Submissions to the conference were invited to address the following key themes:

- Digital education in schools, universities, and other educational institutions
- National policies and plans for digital competence
- Learning with digital technologies
- Learning about digital technologies and computing

Altogether, 42 submissions of full and short papers, symposia, and system presentations were received and reviewed by an International Program Committee and additional reviewers in a double-blind peer review process. Among these submissions were 30 full and short papers, from which 24 were accepted for publication in the volume at hand. The overall acceptance rate was 80%. Each of these papers was reviewed by at least three reviewers. The papers in this book arise from contributions from (in alphabetical order) Australia, Austria, the Czech Republic, Denmark, Estonia, Finland, Germany, Ghana, India, Italy, Japan, Latvia, Lithuania, Portugal, Serbia, Slovakia, Spain, Sweden, and the UK, which reflects the conference's success in bringing together and networking experts from many countries worldwide.

The book is structured into four topical sections. There are nine papers in section 1 (Digital education across educational institutions). These cover aspects of teacher education, primary and secondary education, and then further and higher education. They are ordered in that sequence and offer new findings relating to the conference theme of "Digital Transformation of Education and Learning - Past, Present and Future". The first paper by Borukhovich-Weis et al. presents a model of digitalization-related competencies for teacher education, developed by a working group on digitalization in teacher education (WG DidL) at the University of Duisburg-Essen. Next, Černochová and Selcuk present an interesting investigation into primary education student teachers' perceptions of computational thinking using Bebras tasks. Kalaš and Horvathova then present the latest developments in their Emil school coding project and identify a set of related operations that primary pupils should

learn in any particular year. Following this, the paper by Williams and Mead outlines a creative approach to the teaching of Python in secondary schools, giving worked examples of coding practice. The next two papers look at social disadvantage and inclusion. Saito contends that educational support to develop socially disadvantaged young people's digital skills and competencies has a positive impact on digital citizenship, while Cranmer and Lewin report on early findings from a research project carried out in North West England that identifies challenges in relation to the development and implementation of inclusive digital pedagogies. Batur and Brinda's paper follows, which reports on a study about students' difficulties and misconceptions in introductory programming, in the context of game design, while Corinna Mößlacher et al. look at ways to understand, and to encourage, school students' interest in computer science, through workshops and contests. A final paper on practical teaching projects, using Python, follows, in which Weigend outlines some starter projects in Python programming classes at university level.

There are seven papers in section 2 (National policies and plans for digital competence). These are also ordered and report on new insights relating to past, present, and future policy and practice in computing and digital competence in a number of different countries, reflecting the wide international scope of the book. Tatnall begins by presenting a history of the development of computing in Australia over the past fifty years. The next paper by Niemelä et al. summarizes the current situation regarding the introduction of computational thinking concepts and competencies into compulsory education in two Nordic and two Baltic countries. Following this, Fluck and Girgla provide an Australian perspective on the changing computing curricula in eight states and territories, while Kakeshita et al. from the Information Processing Society of Japan (IPSJ) present a report on their curriculum standards strategy, from the standpoint of both the academic and professional communities of computing in Japan. Castro et al. next present an analysis of contemporary, structured, and connected pedagogical approaches to the teaching of digital proficiency/fluency in 21st-century digital literacy. Following this paper, Akayuure describes Vclass, an online project for mathematics delivery at a university in Ghana, assessing the strengths and weaknesses, and ultimately validating it as a means to enhance future students' learning. Finally, Chetti et al. outline the development of digital technology to advance the teaching of smart agriculture in India.

There are five papers in section 3 (Learning with digital technologies). Initially, Andresen looks at vocational education in Denmark during school shutdown, focussing on emergency remote teaching and its implications. Then Aoki et al. analyze practical examples of a real-time online class on 'agriculture in space', using the collaborative learning tool "Digital Diamond Mandala Matrix". Opel and Netzer next describe AsTRA, a project to develop a comprehensive system to acknowledge the prior knowledge of computer science students. One of the goals is to promote permeability between vocational and higher education in computer science. Following this paper, Rötkönen et al. report on a trial of a tele-immersive platform (TIP) with elementary school 6th grade learners (12–13-year-olds) working on an environmental study lesson. They show that the 3D TIP technology has the critical potential to overcome psychological strains due to physical distance in online education. Finally, Pasterk et al. report on DigiFit4All, a project to develop a platform for POOCs (Personalized Open

Online Courses), including open teaching and learning resources, for both pre-higher and higher education.

There are three papers in the last section, section 4 (Management issues). These offer views on educational management, including a history of the significant role of IFIP TC3. Kadijevich et al. provide results of an initial study of what kinds of e-assessment feedback is important to students at university level, with suggestions for further research. Vartiainen suggests new understandings for management on how organizations may learn and fare under uncertainty, volatility, and transitioning to digital collaboration. Finally, Osorio and Banzato analyze the contribution of IFIP TC3 WG 3.7 to the development of the field of 'Information Technology in Educational Management'.

We are pleased to offer leading-edge work through this choice of papers that we hope will be of interest to further inspire your own work.

January 2022

Don Passey
Denise Leahy
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