
Encyclopedia of Education and Information Technologies

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Encyclopedia of Education and Information Technologies

With 339 Figures and 183 Tables

 Springer

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Preface

Computers today invade almost every aspect of our lives and are used in many different ways, education being no exception. This, of course, was not always the case, and computers today are used in many different ways from the calculating machines from which they evolved. The *stored-program electronic digital computer* first appeared in the 1940s, but computing goes back much further than this and can be traced to earlier technologies including the abacus, Antikythera mechanism (ancient Greek analog computer), Napier's bones (logarithms), and Babbage's difference engine that performed many of the mathematical tasks now performed by computers. From a machine designed to perform calculations, the computer soon evolved into an information processing and communications machine that became indispensable around the world.

University courses in computing began in many countries in the Departments of Mathematics in the late 1940s. The question whether *Computer Science* was a branch of science, a branch of engineering, or whether it was something else entirely unique was long discussed, and it was not until the mid-1960s that university courses in Computer Science as a separate discipline became widely available. Largely due to increased computerization of government departments and the growing computing needs of businesses, in the 1970s university courses in *Business Computing* began to appear. These soon evolved into what we now call *Information Systems*. Today, university courses make use of computers in many ways in both teaching and in research.

It was in the 1970s that school computing began around the world when a small number of schools in some countries began using shared minicomputers along with punched cards for teaching programming in conjunction with facilities at local universities. This mostly related to mathematics, and the teachers involved were typically mathematics or science teachers who had done some computer programming in their university degree courses. The arrival of relatively low cost microcomputers such as the Apple II and Tandy TRS-80 in the late 1970s marked the beginning of the growth of computers in schools. In the 1980s, the curriculum of many schools included teaching *Computer Literacy* as well as some *Computer Science*. Computer use in subject areas followed with the use of databases, spreadsheets, and word processing. Perhaps the biggest innovation though was word processing, which was quickly adopted in many subject areas. Since then, the advent of the Internet, World Wide Web, Wi-Fi, Bluetooth, mobile computers, iPads, mobile phones, and social media has changed the face of educational

computing out of recognition and led to the ways we use computers in education today.

To confuse the issue, there has always been some debate about a title for this area: Computer Science, Computing, Information Technology (IT), and Information and Communication Technologies (ICT) are all titles used by people in different countries. Information Technology today is approached in education in two different ways: teaching about computing in some shape or form (Computer Science) or making use of computers in different subject areas.

This encyclopedia covers all aspects of the use of computers and information technology in every part and form of education. It covers aspects of teaching about computing and use of IT in many different subject areas. It covers computing in early childhood education, computers in primary schools, computers in secondary schools, computer-related professional training and professional development, computers in universities, and computers in training colleges. All chapters have been peer-reviewed by at least two reviewers.

The topics covered include IT and lifelong learning, assistive technologies for special education and people with disabilities, history of educational computing, IT education resources, educational computer games, mobile technologies, designing new educational products, innovation and adoption, computer science, information systems, classroom computing, using the computer as a teaching aid, teachers and IT, computing education research, online learning, global policies and issues, social networking, digital literacy, educational assessment using IT, educational management, IT issues in developed and developing countries, and sociocultural issues with this technology.

Many teachers and academics have worked on writing chapters, and the encyclopedia has been assembled by a team of Section Editors. The encyclopedia has contributions from authors from universities, schools, government departments, and institutions in the following 46 countries: Australia, Austria, Bahrain, Belgium, Canada, China, Colombia, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, India, Ireland, Israel, Italy, Japan, Kazakhstan, Kuwait, Lithuania, Macau, Malaysia, New Zealand, Nigeria, Norway, Oman, Poland, Portugal, Russia, Saudi Arabia, Serbia, Singapore, South Africa, Spain, Sweden, Switzerland, the Czech Republic, the Netherlands, the Philippines, the UAE, the UK, and the USA.

A hardworking editorial team has brought this encyclopedia into existence through the selection of and invitation to authors and the review of their work. The team consisted of Sigrid Schubert (University of Siegen, Germany), Eric Sanchez (*University of Fribourg, Switzerland*), Jari Multisilta (*Tampere University of Technology, Finland*), Arthur Tatnall (Victoria University, Australia), Vassilios Argyropoulos (University of Thessaly, Greece), Sam Goundar (Victoria University of Wellington, New Zealand), Don Passey (Lancaster University, UK), Bill Davey (*RMIT University, Australia*), Monique Grandbastien (Université de Lorraine, France), Tony Jones (*University of Melbourne, Australia*), Javier Osorio (*Universidad de Las Palmas de Gran Canaria, Spain*), Faten Abdel-Hameed (University of Bahrain, Bahrain), and Joseph Chao (Bowling Green State University, Ohio, USA).

This encyclopedia aims to offer teachers, scholars, parents, and the general public an indication of the breadth and importance of how Information Technology is used in all forms of education. It illustrates the many ways in which IT is being used in education.

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May 2020

Arthur Tatnall

List of Topics

Assistive Technologies for Special Education and People with Disabilities

Section Editor: *Vassilios Argyropoulos*

Assisting People Who Are Deaf or Hard of Hearing Through Technology
Assisting People with Autism Spectrum Disorder Through Technology
Assisting People with Physical Disabilities Through Technology
Assisting People with Vision Impairments Through Technology
Assisting Students with Attention Deficit Disorder Through Technology
Assisting Students with Intellectual Disability Through Technology
Assisting Students with Learning Disabilities Through Technology
Assistive Technology and Inclusion, Philosophical Foundation
Assistive Technology and the Gifted Learner
IT on Teaching and Learning Process of Visually Impaired Students

Classroom Use

Section Editor: *Don Passey*

Blending Learning Provision for Higher Education, Integrating “New Ways” of Teaching and Learning
BYOD in the Classroom, Opportunities, Issues, and Policies
Classroom Use, Blended Learning

Collaborative Learning and Patterns of Practice
Computer-Assisted Instruction, Changes in Educational Practice as a Result of Adoption of ICT
Computer-Assisted Learning
Computer-Based Learning, Computational Thinking, and Constructionist Approaches
Computer-Based Training and School ICT Adoption, A Sociocultural Perspective
Distance Learning
E-Books Among Students, Advancements in Higher Education
Educative Value of Digital Storytelling
Ethics and Learning for Teacher Trainees, Team-Based Simulations in Cases of Bullying in School
Flexible and Distance Learning
ICT-Based Inclusive Education
Makerspaces
Mobile Learning and Ubiquitous Learning
Online Teaching, Emotions, and Emoticons in Computer-Mediated Communication
Teaching with LOGO Philosophy
Technology-Enhanced Learning

Computers in Primary Schools

Section Editor: *Anthony Jones*

Algorithmic Thinking in Primary Schools
Capturing Learning Through Mobile Device Cameras
Design in K-5 Programming Projects, Role of Digital Media Boards in Primary Schools, Use of

Digital Storytelling, Information, and Education
Exploratory Study Using Self-Regulated Self-
Development (SRSD) and Technology in the
Context of the Classroom
Shared Regulatory Planning in Minecraft

Computers in Secondary Schools

Section Editor: *Sigrid Schubert*

Competency Models in Computing Education
Computational Thinking
Computers in Secondary Schools
Computing Education, Practices in
Curricula in Computer Science
International Olympiads in Informatics
Mobile Computing and Mobile Learning
Problem-Solving in Computer Science, Learning
from a Gifted Peer
Programming and Coding in Secondary Schools
Programming Languages for Secondary Schools,
Java
Programming Languages for Secondary Schools,
Python
Programming Misconceptions at the K-12 Level
Social Media and Networks as Digital Instruction
and Learning Platforms
Teaching About Computing
Teaching with Computing, Educational Games
Value of Teaching Computer Science

Computers in Universities (and other Higher Education)

Section Editor: *Bill Davey*

Affordances of Technological Connectivist Tools
in Higher Education
Agile Methodology in Education of IT Students,
Application of
Agile Methods and Team Work in IT Education
Applying Software Engineering Principles in
Android Development
Art Component of Remote Training in Russian
Universities
Clicker Interventions, Promoting Student Activity
and Feedback at University Lectures
Digital Technologies in Higher Education,
Learning Challenges

eLearning in Saudi Arabian Universities, Toward
Blended Learning
eXtreme Model-Driven Development
(XMDD) Technologies as a Hands-On
Approach to Software Development
Without Coding
First Programming Language in Introductory
Programming Courses, Role of
Gender Differences in Computer Science
Departments
Indications for Kinesthetic Learning Through
Haptic Devices
Information and Communication Technologies'
Pedagogical Affordances in Education
Innate Abilities and Learning in Higher
Education
Institutional Repositories Versus Learning Object
Repositories, Challenges and the Way Forward
for Higher Educational Institutions
Knowledge Economy of Faculty Competencies of
Indian Business School
Learning Behaviors in Programming
Learning Management Systems, An Overview
Learning Programming, Student Motivation
Learning Programming, Success Factors
Learning Strategies and Achievement of IT
Students in Higher Education
Modeling of Games and Game Strategies
Modeling of Scientific Workflows
Predicting ICT Skills and ICT Use of University
Students
Prior Programming Experience of Undergraduate
Computing and Engineering Students in
Ireland
Programming Language Selection for University
Courses
Programming Languages for University Courses
Smart Board Technology in Higher Education
Institutions
Software Development Processes Designed for
First Year Computing Undergraduates
Tablet Use in Higher Education
Teaching Computer Languages in Universities
Teaching Software Design Techniques in
University Courses
Technology-Enhanced Learning in Programming
Courses, Role of
Value of Teaching PRINCE2 Project
Management Methodology

Computing Education Research

Section Editor: *Monique Grandbastien*

Comparative Analysis of E-Governance and IT Governance

Qualitative Methods, Lesson for Information Systems Researchers

Computing in Early Childhood Education

Section Editor: *Anthony Jones*

Educators and Children Perceiving Affordances with Working Technologies in Early Childhood Settings

Positioning Children with Digital Interactive to Enable Early Conceptual Learning

Designing New Educational Products

Section Editor: *Arthur Tatnall*

Adoption of Innovative ICT-Enabled Systems for Analysis- and Intuition-Styled Teachers in Primary Schools

Bunyip, The Australian Educational Computer that Was Never Built

Interactive Displays, Use of Interactive Charts and Dashboards in Education

Using Social Media to Promote Academic Functioning

Developed and Developing Countries

Section Editor: *Sam Goundar*

Adoption of Virtual Laboratories in India, Learning Assessments and Roles of ICT Skill Learning Tools

Building Rural Renaissance and Suburban Development with Interactive Technology Solutions in India

Safe Frames, Essential Determinant for Educational Technology Implementation in an Indigenous Context

Digital Literacy

Section Editor: *Jari Multisilta*

Digital Literacy, Creativity, and Autonomous Learning

Digital Simulations in Healthcare Education

Digital Storytelling in Teaching and Research

Distributed Collaboration in Project-Based Learning and Its Assessment in Next-Generation Learning Environments

Learning with Simulations in Healthcare

Primary School Classroom Writing Interventions Using Technologies

Problem-Based Learning Online

Teaching and Learning Computational Thinking and Coding Skills

Educational Assessment

Section Editor: *Faten S. M. Abdel-Hameed*

E-Portfolio in Higher Education

Information Technology and Assessment

WhatsApp for Electronic Feedback and Assessment

Educational Management

Section Editor: *Javier Osorio*

Attendance Records, Educational Management

Computers in Education in Developing Countries, Managerial Issues

Data Mining for Educational Management

Decision Support Systems and Knowledge Management in Education

Human, Social, and Ethical Aspects of Information Technology Management Systems

Information Technology for Local Education

Authorities and School Districts, Use of IT in Educational Institutions, Planning and Development of

School Management Software in a Primary School in Victoria, Use of

Security and Privacy of Information Technology Management Systems

Social Networks in Higher Education
Management
Support for School and Institutional Improvement
and Accountability

Educational Resources

Section Editor: *Bill Davey*

Augmented Reality and Its Use in Education
Augmented Reality in Education, Scope of Use
and Potential
Data Science Education
Designing Assessments for Blended Learning
Scenarios
Formats of Virtual Learning
Robotics in Education
Social Media in Shadow Education in China, An
Introduction

Games

Section Editor: *Eric Sanchez*

Blended Learning
Computers in Primary Schools, Educational
Games
Computers in Secondary Schools, Educational
Games
Educational Assessment, Educational Data
Mining, and Learning Analytics
Educational Resources, Geographical
Information, Geomedia, and Learning
Educational Resources, Hypermedia
Game-Based Learning
Games in Higher Education
Games, Simulations, Immersive Environments,
and Emerging Technologies
Gamification
Teaching Machines

Global Policies and Issues

Section Editor: *Don Passey*

Computers and Educational Improvement
Computing Education, Outcomes of
Digital Technologies and Literacy Contexts for
Young Indigenous Children

Intercultural Education in the Digital Age
International Reports (Including OECD)
Leadership on Information Technology in
Education
Literacy and Technology
Mathematics Education and Technology
Methodological Quality of Educational
Technology Meta-analyses
Policy Rationales and Integration
Rationales, Implications for Subject
Area Teaching
Promises and Prospects of Educational
Technology, Evidence from Systematic
Reviews and Meta-analyses
Science Education and Technology
Underrepresentation of Girls in Computing

History of Educational Computing

Section Editor: *Arthur Tatnall*

Beginnings of Computing in School Education in
Australia
Birth of Information Systems Curricula in
Victoria in Colleges of Advanced Education
and Universities
Computing Curricular Report CE2016, A
Summary
Computing Curricular Report IT2017, A
Summary
Control Technology and School Curricula in the
Late 1980s in Australia
Information and Communication
Technologies in Chilean Schools, from
Enlaces to the Present Day
Pedagogical Possibilities for the History of
Computing
Rationales for Information Technology in
Schools, Historical Perspective
Why Teach History of Computing?

Innovation and Adoption

Section Editor: *Arthur Tatnall*

Different Methodological Approaches to
Considering the Adoption of ICT
Modeling the Process of Information Technology
Innovation in Education

Situative Perspective and Determinants of
Technology Acceptance in Educational
Technology
Technological Innovation in ICT for Education
Ultrahigh

Life-Long Learning

Section Editor: *Don Passey*

Assisting Elderly Non-computer-Literate People
with Computer-Based Communications
Lifelong Learning for Working People

Mobile Technologies

Section Editor: *Bill Davey*

Android-Based Mobile Apps for Hands-On
Education
Mobile Learning, Challenges in
WalkAbout Framework for Contextual Learning
Through Mobile Serious Games

Online Learning

Section Editor: *Jari Multisilta*

Artificial Intelligence in Education
Multimodal Learning Analytics
Open Educational Resources and Distance
Learning, Challenges and the Way Forward in
Higher Education
Teacher–Student Relationship and Online Social
Networks

Professional Training and Professional Development

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Positive Integration of ICT to Reshape the
Learning Process in Large Corporates
Sustaining Digital Technology Use in
Professional Communities

Social Networking

Section Editor: *Arthur Tatnall*

Collaboration and Social Networking
Creative Commons
Social Media for Tertiary Education
Social Networking in Higher Education
Wikis as a Collaboration Tool

Socio-cultural Issues and Technology

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Challenge of Transforming Curricula with
Computers, High Impact Interventions and
Disruption
Digital Citizenship, A Sociocultural Snapshot
Gender Difference in Self-Efficacy for
Computational Thinking in K-12

Subjects

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Implementation of ICT in Secondary Schools
Snap! Programming System
Technologies in Mathematics Education

Teachers and IT

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Educational Support on Computing and
Informatics for Disadvantaged Groups, An
Empowerment Perspective
Empowerment and Disempowerment in Peer
Observation Within Pre-service Teacher,
Technology-Assisted Integrated STEM
Education
Facebook Use in Malaysian Higher Education
Classroom
MOOCs, Teacher Professional Learning and
Deep Learning Conversations

Restructuring Teachers' Knowledge for Teaching with Technologies with Online Professional Development	Teacher Education and Professional Development for Technology Integrated Teaching
Students' Computer Literacy and the Use of Tablets in Upper Secondary Schools	Teacher Education, Thinking About ICT Video-Enhanced Feedback

About the Editor



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Dr. Arthur Tatnall began his career as a secondary school physics and mathematics teacher before getting into computing in the late 1970s when his school obtained a 16k Apple II computer. In the 1980s he went on to become a *Computer Education and General Curriculum Consultant* and later worked as *Educational Computer Systems Analyst* at the Victorian State Computer Education Centre. He served as *Chief Examiner* for Year 12 Computer Science in Victoria from 1984 to 1991. In 1988 he took up a university position teaching and researching Information Systems at Footscray Institute in Victoria and then moving to Western Institute before the two institutions combined to form Victoria University. He has also been *President of the Computing in Education Group of Victoria*, *Director of the Victorian Information Technology Teachers Association*, and *Board Member of the Australian Council for Computers in Education*.

Arthur has undergraduate degrees in Science, Education, and Computer Science. In his Master of Arts research, he investigated the history of the origin of the discipline of Information Systems (IS) in Australia and how universities then devised IS curricula. In his Ph.D., he used actor-network theory to investigate the adoption of Visual Basic into the curriculum of an Australian university.

Arthur is a Fellow of the Australian Computer Society (ACS) and has served on the ACS Victorian Branch Executive Committee. He has been Editor of the *ACS Victorian Bulletin* and a member

of the ACS ICT Heritage Project. He is active in the International Federation for Information Processing (IFIP) as a member of WG 9.7 (History of Computing), WG 3.4 (Professional and Vocational Education in ICT), and WG 3.7 (IT and Educational Management).

He has authored and coauthored a number of computing textbooks and edited several IFIP Conference books. He was also Editor of the *Encyclopedia of Portal Technology and Applications* and, from 2009 to 2016, Editor in Chief of the *International Journal of Actor-Network Theory and Technological Innovation*. He is currently Editor in Chief of the journal of *Education and Information Technologies* (Springer Nature) and has published widely in journals, books, and book chapters.

Arthur's research interests include technological innovation, history of technology, computers in education, IT in educational management, information systems curriculum, and project management. Much of his research is based on the use of actor-network theory.

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