

IBE SPECIAL ALERT EMERGING TECHNOLOGIES



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The IBE has compiled this list of resources on Future Competencies to assist curriculum developers, researchers and practitioners.

Most of the publications and documents are freely accessible online. Direct access to the materials is indicated by the symbol: @

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In June 2018, IBE-UNESCO organized the latest session of its Learning Series entitled “The Future of Africa: AI, Robotics, and Education.” The event featured Ethiopia’s leading youth technology entrepreneur Ms. Betelhem Dessie Asnake, who urged for emerging technologies to be integrated in the curricula of education systems. Her talk falls under the IBE-UNESCO’s initiative “Fostering Future Generations of Technologists,” which emphasizes the importance of emerging technologies in education. Only by establishing a foundation of knowledge will we be able to prepare for the future of curriculum development, learning, and assessment, and it’s in this spirit that we offer our latest special alert on emerging technologies.

(UNESCO-IBE)

Artificial Intelligence

Effects of Using Artificial Intelligence Teaching System for Environmental Education on Environmental Knowledge and Attitude
Huang, Shien-Ping; Eurasia Journal of Mathematics, Science and Technology Education July 2018



@ Human decisions: thoughts on AI
Netexplo; UNESCO, 2018

@ The UNESCO Courier: Artificial Intelligence: The promises and the threats
UNESCO, July-September 2018
French
Spanish

@ What does the research say about how Artificial Intelligence and Big Data can close the achievement gap?

du Boulay, Ben; Poulivasillis, Alexandra; Holmes, Wayne; Mavrikis, Manolis; Enhancing Learning and Teaching with Technology, 2018

Big data

Applying e-learning systems for big data education

Arkit, A.; Arkit, G.; Robak, S.; Information Systems in Management, 2018

Big Data Emerging Technology: Insights into Innovative Environment for Online Learning Resources

Huda, M., Maseleno, A., Atmotiyoso, P., Siregar, M., Ahmad, R., Jasmi, K. & Muhamad, N.; International Journal of Emerging Technologies in Learning (IJET), 2018

@ Learning Analytics: at the Nexus of Big Data, Digital Innovation, and Social Justice in Education

Aguilar, Stephen J.; TechTrends, 2018

Coding

@ Coding skills as a success factor for a society

Multisilta, Jari; Tuomi, Pauliina; Saarikoski, Petri; Suominen, Jaakko; Education and Information Technologies, January 2018

@ I, Pseudocoder: Reflections of a Literacy Teacher-Educator on Teaching Coding as Critical Literacy

Baker-Doyle, Kira J.; Contemporary Issues in Technology and Teacher Education, 2018

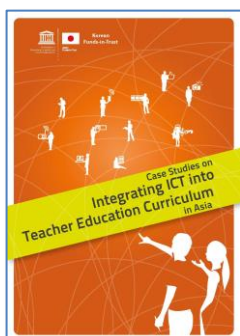
@ Reframing Coding as “Mathematization” in the K-12 Classroom: Views from Teacher Professional Learning

Brown, Barb; Rushton, Kenzie; Sengupta, Pratim; Shanahan, Marie-Claire; Alberta Science Education Journal, April 2018

Emerging technologies in curriculum

@ A preliminary study of school administrators' use of information and communication technologies: Bruneian perspective

Seyal, Afzaal H. International Journal of Education and Development using Information and Communication Technology V.8(1), 2012



@ Case Studies on integrating ICT into teacher education curriculum in Asia
UNESCO Bangkok, 2013

Critical thinking for 21st-century education: a cyber-tooth curriculum?

Prospects, UNESCO-IBE, December 2014

@ Education in Thailand: an OECD-UNESCO perspective

UNESCO/OECD, 2016

@ Educational technology on a turning point: curriculum implementation in Flanders and challenges for schools

Ruben Vanderline; Johan van Braak; Ruben Hermans, Educational Technology, Research and Development; August 2009 (**ProQuest**)

@ Emerging Influences of Information Technology on School Curriculum

C. Dede, Journal of Curriculum Studies, 2000

@ Intentional ICT: curriculum, education and development

UNESCO-IBE, March 2016

@ Information and communication technology (ICT) in education in five Arab States: a comparative analysis of ICT integration and e-readiness in school in Egypt, Jordan, Oman, Palestine and Qatar

UNESCO-UIS; Talal Abu-Ghazaleh Organization, 2013

Integration of technology, curriculum, and professional development for advancing middle school mathematics: Three large-scale studies

Jeremy Roschelle, et. al., American Education Research Journal, 2014

@ Laptop, andamiaje para la educación especial: guía práctica, computadoras móviles en el currículo

UNESCO Montevideo, 2011

@ Multimedia in education: curriculum

UNESCO-IITE, 2013



@ Sharing Malaysian experience in participation of girls in STEM education

Soo Boon Ng; UNESCO-IBE, 2016

French
Spanish

Emerging technologies in Early Childhood and Primary Education

@ L'enfant et les écrans

Jean-François Bach, Académie des sciences, janvier 2013

@ Measuring ICT use and contributing conditions in primary schools

Ruben Vanderline, Koen Aesaert, Johan van Braak, British Journal of Educational Technology, 2015

@ ICT in primary education: analytical survey, vol. 2: policy, practices, and recommendations
UNESCO-IITE, 2014

@ ICT in primary education: analytical survey, vol. 3: collective case study of promising practices

UNESCO-IITE, 2014

@ Les politiques éducationnelles d'équipement du numérique à l'école primaire. Entre vœux et contraintes.

Olivier Grugier, Symposium Ecole et TICE, colloque JOCAIR, août 2014

@ Rapport 2012 consacré aux droits de l'enfant : Enfants et écrans : grandir dans le monde numérique - Rapport 2012 consacré aux droits de l'enfant

D. Buis, M. Derain. Le Défenseur des droits, 2012

@ The role of ICT in early childhood education: Scale development and research on ICT use and influencing factors

Johan van Braak, Ruben Vanderline, Stephanie Kerckaert, European Early Childhood Education Research Journal, April 2015

Emerging technologies in Education Policy

@ Albania: education policy review; issues and recommendations, extended report UNESCO, 2017

@ Asia Pacific Ministerial Forum on ICT in Education 2012: outcome document UNESCO Bangkok, 2013

@ Entornos digitales y políticas educativas: dilemas y certezas

Lugo, María Teresa; UNESCO-IIEP, 2016

@ ICT in education policy, infrastructure, and ODA status in selected ASEAN countries UNESCO Bangkok, 2013

@ Informe sobre tendencias sociales y educativas en América Latina, 2014: políticas TIC en los sistemas educativos de América Latina

UNESCO-IIEP; UNESCO-IIEP; OEI, 2014

@ Managing tomorrow's digital skills: what conclusions can we draw from international comparative indicators?

Fau, Simon; Moreau, Yasmeen; UNESCO, 2018

@ Mapping and analyzing prospective technologies for learning. Results from a consultation with European stakeholders and roadmaps for policy action

S. acto et al. JRC Institute for Prospective Technological Studies, 2014

@ A Policy Review: building digital citizenship in Asia-Pacific through safe, effective and responsible use of ICT

UNESCO Bangkok, 2016

@ Positioning ICT in education to achieve the Education 2030 Agenda in Asia and the Pacific: recommendations for a regional strategy

UNESCO Bangkok, 2018



@ Transformer l'éducation: le pouvoir des politiques relatives aux TIC UNESCO, 2013 English

Emerging technologies in Education Reform

@ Tecnologías digitales al servicio de la calidad educativa: una propuesta de cambio centrada en el aprendizaje para todos UNESCO Santiago, OREALC, 2016

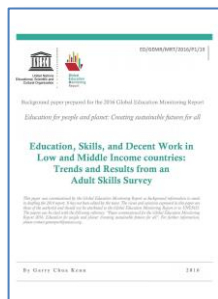
Emerging technologies and Future Competencies

@ 21st Century Skills and Digital Literacy: An India Case Study SAIS-ASER Centre Practicum, 2014-2015

@ Challenges and opportunities for teacher professional development in interactive use of technology in African schools Hennessy, S. et al., University of Cambridge, 2015

@ Digital Strategy for Schools 2015-2020:
Enhancing Teaching, Learning and
Assessment

Ireland Department of Education and Skills,
2015



@ Education, skills, and
decent work in low and
middle income countries:
trends and results from
an adult skills survey
UNESCO-GEMR, 2016

@ enGauge 21st Century Skills: Literacy in
the Digital Age

North Central Regional Educational Laboratory
& the Metiri Group, 2003

@ ICT-enabled innovation for learning in
Europe and Asia: Exploring conditions for
sustainability, scalability and impact at system
level

Joint Research Centre of the European
Commission, 2013

Emerging technologies in gender and education

@ Cracking the code: empowering rural
women and girls through digital skills; side
event during the 62nd session of the
Commission on the Status of Women, 14
March 2018, United Nations Headquarters:
report

UNESCO, 2018



@ Foro Consultivo
Internacional:
Enseñanza de las
Ciencias en
Preescolar con
Enfoque de Género
UNESCO Mexico,
2017

@ Measuring gender equality in science and
engineering: the SAGA toolkit, working paper 2
UNESCO, 2017

Emerging technologies in Inclusive Education

@ VIII Jornadas de Cooperación Educativa
con Iberoamérica sobre Educación Especial e
Inclusión Educativa: Accesibilidad e Inclusión
Educativa, Montevideo, Uruguay, 3 al 7 de
octubre de 2011

UNESCO Santiago, OREALC, 2014

@ Accessible ICTs and Personalized Learning
for Students with Disabilities: a dialogue
among Educators, Industry, Government and
Civil Society; Consultative expert meeting
report

UNESCO, 2011

French
Spanish

@ Digital empowerment: access to
information and knowledge using ICTs for
persons with disabilities

UNESCO, 2016

@ ICTs in education for people with
disabilities: review of innovative practice

Watkins, Amanda; Tokareva, Natalia; Turner,
Marcella; UNESCO-IITE, 2011

@ Learning for All: guidelines on the inclusion
of learners with disabilities in distance learning

UNESCO, 2016

@ Model policy for inclusive ICTs in education
for persons with disabilities

UNESCO, 2014

@ Re-orienting Education Management
Information Systems (EMIS) towards inclusive
and equitable quality education and lifelong
learning

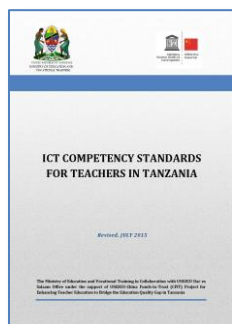
UNESCO, 2018

Emerging technologies and teachers

@ 74 buenas prácticas docentes: experiencias con tecnología en aulas peruanas
UNESCO Lima, 2017

@ Diverse approaches to developing and implementing competency-based ICT training for teachers: a case study
UNESCO Bangkok, 2016

@ Docentes y sus aprendizajes en modalidad virtual
UNESCO Lima, 2017



@ ICT competency standards for teachers in Tanzania
UNESCO, Ministry of Education and Vocational Training, 2015

@ ICT Essentials for Teachers based on the UNESCO ICT Competency Framework for Teachers
UNESCO-KFIT, Rwanda Ministry of Education, April 2017

ICT standards and competencies from the pedagogical dimension: a perspective from levels of ICT adoption in teachers' education practice
Valencia-Molina, Tatiana; UNESCO Santiago; Pontificia Universidad Javeriana (Colombia), 2016

@ IICBA capacity building project in Ethiopia in the framework of UNESCO Chinese Funding In Trust programme: Improving Teacher Quality by Using ICT and ODL; report of workshop and related activity, 16-20th December 2013, Hawassa, Ethiopia
UNESCO-IICBA, 2014

@ In pursuit of smart learning environments for the 21st century
Singh, Abtar Darsham; Hassan, Moustafa; UNESCO-IBE, 2017

Is it the way they use it? Teachers, ICT and student achievement

Simona Lorena Comi and al., Economics of Education Review 56 (2017) 24–39, February 2017

@ Mapping of ICT for teacher training activities in Rwanda
UNESCO-KFIT, Rwanda Ministry of Education, April 2017

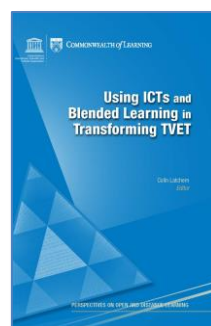
@ Monitoring & evaluation strategy for the Rwandan ICT Essentials for Teachers Course
UNESCO-KFIT, Rwanda Ministry of Education, April 2017



@ Supporting teachers with mobile technology: lessons drawn from UNESCO projects in Mexico, Nigeria, Pakistan and Senegal
UNESCO, 2017

Emerging technologies in TVET

@ Working Group on Education: digital skills for life and work
UNESCO/ITU Broadband Commission for Sustainable Development, 2017



@ Using ICTs and blended learning in transforming technical and vocation education and training
Latchem, Colin; UNESCO; COL, 2017

Mobile learning

@ The Future of mobile learning: implications for policy makers and planners

C. Shuler, et. al. UNESCO, 2013

French

Spanish

Learning Anywhere, Anytime: Student Motivators for M-learning

R. Martin et al. Informing Science Institute, April 2013

@ La Lectura en la era móvil: un estudio sobre la lectura móvil en los países en desarrollo

West, Mark; Chew Han Ei, UNESCO, 2015
English

@ Révision comparative des initiatives nationales d'apprentissage mobile en Amérique Latine: les cas du Costa Rica, de la Colombie, du Pérou et de l'Uruguay, rapport d'analyse comparative, note de synthèse/version abrégée

UNESCO-IIEP, 2016

English

French

@ UNESCO policy guidelines for mobile learning

R. Kraut, UNESCO, 2013

French

Spanish

@ Usages des médias, de l'image et des technologies de l'information et de la communication (MITIC) au Secondaire II - Comment tenir compte des acquis du Plan d'étude romand et du Lehrplan 21 ?

Marie-Thérèse Rey, Jean-Claude Domenjoz. Société suisse de l'informatique dans l'enseignement, 2013

@ Turing on mobile learning: global themes

Mark West, UNESCO, 2012

French

Spanish

@ Turing on mobile learning in Africa and the Middle East: illustrative initiatives and policy implications

Isaacs, Shafika. UNESCO, 2012

@ Turing on mobile learning in Asia: illustrative initiatives and policy implications
Hyo-Jeong, So. UNESCO, 2012

@ Turing on mobile learning in Europe: illustrative initiatives and policy implications

Hylen, Jan. UNESCO, 2012

@ Turing on mobile learning in North America: illustrative initiatives and policy implications

Fritschi, Jennifer; Wolf, Mary Ann. UNESCO, 2012

@ Turing on mobile learning in Latin America: illustrative initiatives and policy implications

Lugo, María Teresa; Schurmann, Sebastián. UNESCO, 2012

Spanish

Open Educational Resources (OER)

Assessment approaches in massive open online courses: possibilities, challenges and future directions

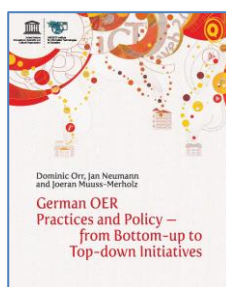
UNESCO-UIL, April 2018

Beyond the "c" and the "x": learning with algorithms in massive open online courses (MOOCs)

UNESCO-UIL, 2018

@ Current state of advancement of open educational resources in Kenya

Atieno Adala, A.; UNESCO-IITE, 2016



@ German OER practices and policy: from bottom-up to top-down initiatives
UNESCO-IITE, 2017

@ Guía básica de recursos educativos abiertos (REA)

Butcher, Neil; Kanwar, Asha; Uvalic-Trumbic, Stamenka, UNESCO, 2015

English

El aprendizaje para todos: directrices sobre la inclusión del alumnado con discapacidad en la educación abierta y a distancia

Chambers, Dianne; Varoglu, Zeynep; Kasinskaite-Buddeberg, Irmgarda; UNESCO, 2018

Learning potentials and educational challenges of massive open online courses (MOOCs) in lifelong learning

UNESCO-UIL, 2018

@ Making sense of MOOCs: a guide for policy makers in developing countries

Patru, Mariana; Balaji, Venkataraman; UNESCO and COL, 2016

@ Open educational resources: policy, costs, transformation

Miao, Fengchun; Mishra, Sanjaya; McGreal, Rory; UNESCO and COL, 2016

Perceptions of authority in a massive open online course: an intercultural study

UNESCO-UIL, 2018

@ Ressources éducatives libres en France: regards, perspectives et recommandations

UNESCO-IITE, 2014

English

Teachers' roles in light of massive open online courses (MOOCs): evolution and challenges in higher distance education

UNESCO-UIL, 2018



@ Tendencias sobre contenidos educativos digitales en América Latina

UNESCO-IIPE; OEI, 2016

Upscaling the number of learners, fragmenting the role of teachers: how do massive open online courses (MOOCs) form new conditions for learning design?

UNESCO-UIL, 2018

Reports and studies

Building and Sustaining National Educational Technology Agencies : Lessons, Models and Case Studies from Around the World

The World Bank, 2017

@ Cyberlearning Community Report: The State of Cyberlearning and the Future of Learning With Technology

The Center for Innovative Research in Cyber Learning, 2017

The digital revolution: the impact of the fourth industrial revolution on employment and education

Kenneth Baker, Edge, 2016

@ Digital technologies. Hangarau Matihiko. Draft for consultation

New Zealand Ministry of Education, 2017

@ Education Technology Plan Update

U.S. Department of Education, January 2017

@ Exploiter le potentiel des TIC: programmes efficaces d'alphabétisation et de numératie utilisant la radio, la télévision, le téléphone mobile, les tablettes et les ordinateurs

UNESCO-UIL, 2017

@ Flexible learning strategies: country case report; Regional Meeting on Alternative Learning/Schooling Programmes for Primary Education to Reach the Unreached; outcome document

UNESCO Bangkok, 2013

@ La grande Ecole du Numérique, une utopie réaliste

S. Distinguin et al. Ministère de l'Économie, des Finances et de l'Industrie et al. septembre 2015

@ Harnessing the potential of ICTs: literacy and numeracy programmes using radio, TV, mobile phones, tablets and computers; selected case studies from the UNESCO Effective Literacy and Numeracy Practices database (LitBase)

Hanemann, Ulrike; Scarpino, Cassandra; UNESCO-UIL, 2016

French

@ ICT in STEM Education - Impacts and Challenges: On Students. A STEM Alliance Literature Review

European Schoolnet , June 2017



@ ICT Transforming Education in Africa UNESCO-KFIT project update, April 2018 UNESCO-KFIT, April 2018

@ Information and communication technology (ICT) in education in Asia: A comparative analysis of ICT integration and e-readiness in schools across Asia

UNESCO-UIS, April 2014

@ Information and communication technology (ICT) in education in Sub-Saharan Africa: a comparative analysis of basic e-readiness in schools

UNESCO-UIS, 2015

French

@ Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills

OECD, September 2016

@ Innovating Pedagogy 2013

M. Sharples et al. The Open University, 2013

L'Intérêt pour les sciences et la technologie à l'école: résultats d'une enquête auprès d'élèves du primaire et du secondaire au Québec

Abdelkrim Hasni, Patrice Potvin, Chaire de recherche sur l'intérêt des jeunes à l'égard des sciences et de la technologie, octobre 2015

@ Jules Ferry 3.0, Bâtir une école créative et juste dans un monde numérique

Conseil national du numérique, octobre 2014



@ Leveraging information and communication technologies to achieve the Post-2015 Education goal: report of the International Conference on ICT and Post-2015 Education UNESCO, 2015 French

@ Migrer des ordinateurs aux tablettes

S. Burton, P. Devaud, Etat de Fribourg, mai 2012

@ Modern areas and prospects of ICT use in the general education of Russia

UNESCO-IITE, 2011

NMC Horizon Report > 2013 K-12 Education Edition

New Media Consortium, 2013

@ NMC Horizon Report > 2014 Schools Edition

New Media Consortium, 2014



@ Le Numérique au service de l'éducation en Afrique

UNESCO/Agence française de développement, 2015 English

@ Pédagogie + Numérique = Apprentissages 2.0

Rémi Thibert, Dossier d'actualité Veille et Analyses, n° 79, novembre 2012

@ Les pratiques d'enseignement et d'apprentissage avec le numérique : le cas des tableaux blancs interactifs et des tablettes numériques au sein des écoles de la Ville de Bruxelles

Roland, N., Choumane, M. & Vanmeerhaeghe, S., Université libre de Bruxelles, 2016

@ Rethinking Instructional Technology to Improve Pedagogy for Digital Literacy: A Design Case in a Graduate Early Childhood Education Course

TechTrends; V.61(4), July 2017

@ TIC, educación y desarrollo social en América Latina y el Caribe

UNESCO Montevideo, 2017
English

@ Technology, broadband and education: advancing the Education for All agenda

ITU; Broadband Commission for Digital Development, 2013

@ Transforming Education Conference for Humanity: TECH 2017, December 16-18, 2017; post event report

UNESCO-MGIEP, 2018

@ Transformation-Ready: The strategic application of information and communication technologies in Africa Education Sector Study: Final Report

Lishan Adam, et al. African Development Bank, World Bank, African Union, December 2011

@ Uso de TIC en educación en América Latina y el Caribe: análisis regional de la integración de las TIC en la educación y de la aptitud digital (e-readiness)

UNESCO-UIS, 2013

@ L'utilisation pédagogique des dotations en numérique (équipements et ressources) dans les écoles

Jean-Pierre Delaubier, Inspection générale de l'Éducation nationale, 2015

What Happens to IT Education? The Case in Estonia with Some Recommendations for International Discussion

International Journal of Information and Education Technology, March 2017
(ProQuest)

Robotics

How Does the Degree of Guidance Support Students' Metacognitive and Problem Solving Skills in Educational Robotics?

Atmatzidou, Soumela; Demetriadis, Stavros; Nika, Panagiota; Journal of Science Education and Technology, February 2018

@ Report of COMEST on robotics ethics

UNESCO; COMEST, 2017
French

@ Robotics in Education

Curto, B.; Moreno, V.; Journal of Intelligent & Robotic Systems, 2016

@ Robotics and STEM learning: students' achievements in assignments according to the P3 Task Taxonomy—practice, problem solving, and projects

Barak, Moshe; Assal, Muhammad; International Journal of Technology and Design Education, March 2018

@ Social Robotics in Education: State-of-the-Art and Directions

Pachidis, T.; Vrochidou, E.; Kaburlasos, V.; Kostova, S.; Bonković, M.; Papić; 27th International Conference on Robotics in Alpe-Adria-Danube Region, January, 2018

Worldwide

AFRICA

Ethiopia

@ IICBA capacity building project in Ethiopia in the framework of UNESCO Chinese Funding In Trust programme: Improving Teacher Quality by Using ICT and ODL; report of workshop and related activity, 16-20th December 2013, Hawassa, Ethiopia
UNESCO-IICBA, 2014

Kenya

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Atieno Adala, A.; UNESCO-IITE, 2016

Rwanda

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Sub-Saharan Africa

@ Challenges and opportunities for teacher professional development in interactive use of technology in African schools
Hennessy, S. et al., University of Cambridge, 2015

@ Digital services for education in Africa
UNESCO/AFD, 2015
French

@ ICT Transforming Education in Africa
UNESCO-KFIT project update, April 2018
UNESCO-KFIT, April 2018

@ Information and communication technology (ICT) in education in Sub-Saharan Africa: a comparative analysis of basic e-readiness in schools
UNESCO-UIS, 2015
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@ Le Numérique au service de l'éducation en Afrique
UNESCO/Agence française de développement, 2015
English

@ Transformation-Ready: The strategic application of information and communication technologies in Africa Education Sector Study: Final Report
Lishan Adam, et al. African Development Bank, World Bank, African Union, December 2011

Tanzania

@ ICT competency standards for teachers in Tanzania
UNESCO, Ministry of Education and Vocational Training, 2015

ARAB STATES

Egypt, Jordan, Oman, Palestine and Qatar

@ Information and communication technology (ICT) in education in five Arab States: a comparative analysis of ICT integration and e-readiness in school in Egypt, Jordan, Oman, Palestine and Qatar
UNESCO-UIS; Talal Abu-Ghazaleh Organization, 2013

ASIA AND THE PACIFIC

@ Asia Pacific Ministerial Forum on ICT in Education 2012: outcome document
UNESCO Bangkok, 2013

@ Case Studies on integrating ICT into teacher education curriculum in Asia
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Hyo-Jeong, So. UNESCO, 2012

Australia, China, South Korea

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Brunei

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India

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SAIS-ASER Centre Practicum, 2014-2015

Malaysia

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New Zealand

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New Zealand Ministry of Education, 2017

Thailand

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UNESCO/OECD, 2016

EUROPE AND NORTH AMERICA

Albania

@ Albania: education policy review; issues and recommendations, extended report
UNESCO, 2017

Belgium

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Ruben Vanderline; Johan van Braak; Ruben Hermans, Educational Technology, Research and Development; August 2009 (**ProQuest**)

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Roland, N., Choumane, M. & Vanmeerhaeghe, S., Université libre de Bruxelles, 2016

@ The role of ICT in early childhood education: Scale development and research on ICT use and influencing factors
Johan van Braak, Ruben Vanderline, Stephanie Kerckaert, European Early Childhood Education Research Journal, April 2015

Canada

@ Reframing Coding as "Mathematization" in the K-12 Classroom: Views from Teacher Professional Learning
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