2017

WORLD CONFERENCE ON COMPUTERS IN EDUCATION

3-6 JULY 2017 / DUBLIN / IRELAND

Tomorrow's Learning: Involving Everyone

CONFERENCE PROGRAMME

Sunday 2nd July 2017
DOCTORAL CONSORTIUM
IRISH COMPUTER SOCIETY
87 PEMBROKE ROAD

Monday 3rd – Thursday 6th July 2017
THE PRINTWORKS
DUBLIN CASTLE

ifip

ICS
THE SOCIETY FOR CHARTERED
IT PROFESSIONALS IN IRELAND

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Welcome Note

PROF DON PASSEY

CHAIR—INTERNATIONAL PROGRAMME COMMITTEE,
WCCE 2017, DUBLIN, IRELAND

Welcome from the Chair of the International Programme Committee

It is my great pleasure to welcome you to the World Conference on Computers in Education 2017. On behalf of the International Programme Committee *IPC,* we thank you for joining us for this significant conference. I am delighted that we are being hosted in the heart of Dublin by the Irish Computer Society, who have supported and been responsible for particularly important developments in this field. The conference theme *Tomorrow's Learning: Involving Everyone* reflects the long-standing commitment to both learning and technology that has concerned members of the Technical Committee 3 *TC3* and its working groups of the International Federation for Information Processing *IFIP*. While attending this conference we ask you, the researchers, policy makers, developers, teachers, and learners, to come together to share and discuss the current and the future, and to help us discover how we will continue progress in the development and uses of technologies and computing for the benefit of all.

I know that Ireland sees innovation and learning as essential to its future. With three universities rated in the top 50 in the world, together with a wealth of technology companies in the area, it is fitting that Ireland hosts this conference. On behalf of the *IPC*, we very much look forward to meeting you throughout the week.

Local Organising Committee

Denise Leahy—*IFIP WCCE 2017 LOC Chairperson, Board of Directors, ICS Skills*

Michael Tighe—*Secretary of LOC, Irish Computer Society*

Declan Brady—*President, Irish Computer Society*

Jim Friars—*CEO, Irish Computer Society*

Tom O'Sullivan—*Deputy CEO, Irish Computer Society*

Mary Cleary—*Deputy CEO, ICS Foundation*

John Ward—*Irish Computer Society*

International Programme Committee

Don Passey—*Chair of the IPC, Lancaster University, UK*

Sindre Røsvik—*Chair of IFIP TC3, Giske Commune, Norway*

Sigrid Schubert—*IFIP WG3.1 Representative, University of Siegen, Germany*

Andrej Brodnik—*IFIP WG3.3 Representative, University of Ljubjana, Slovenia*

Mikko Ruohonen—*IFIP WG3.4 Representative, University of Tampere, Finland*

Javier Osorio—*IFIP WG3.7 Representative, University of Las Palmas in Gran Canaria, Spain*

Denise Leahy—*Chair of the LOC, Trinity College Dublin, Ireland*

Michael Tighe—*Secretary of the IPC, Irish Computer Society*

Arthur Tatnall—*Lead Editor, Victoria University, Australia*

Mary Webb—*Lead Editor, King's College London, UK*

Christine Bescherer—*Chair of the Doctoral Consortium, University of Ludwigsburg, Germany*

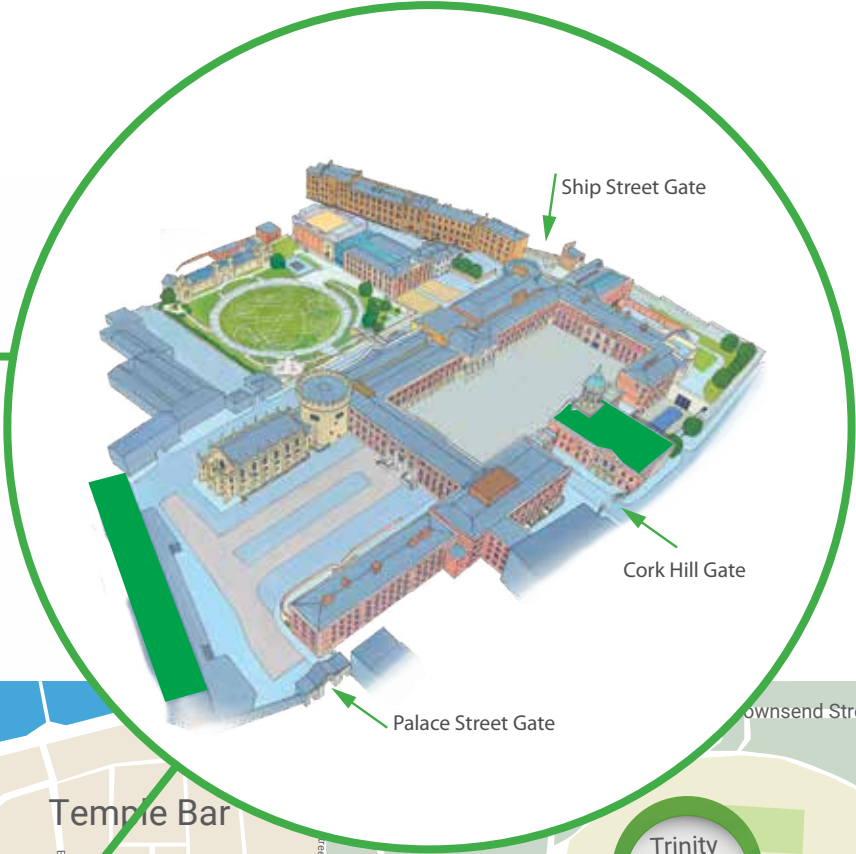**Nicholas Mavengere**—*Associate Editor, University of Tampere, Finland*

Location Guide

Dublin Castle plays host to registration, exhibition, and all conference sessions for the IFIP WCCE 2017 conference. The conference will take place between the Printworks Building in the lower castle yard and Bedford Hall in the upper castle yard of Dublin Castle.

Since its foundation in 1204, Dublin Castle has been at the heart of the history and evolution of the city. Today, spanning an area of over 44,000 square meters (11 acres), the site contains 2 museums, 2 cafés, an international conference centre, 2 gardens, Government Buildings and the State Apartments which are the most important state rooms in the country. The grounds of the site are free to explore, as is the Chapel Royal, the Chester Beatty Library, the Garda Museum and the Revenue Museum. Access to the State Apartments is by guided tour only.

Address: Dame St., Dublin 2
Phone: +353 1 645 8815

Ship Street Gate

Cork Hill Gate

Palace Street Gate

River Liffey

Grattan Bridge

Essex Quay

Wood Quay

Temple Bar

Fishamble Street

Parliament Street

Eustace Street

Palace Street

Cork Hill

Dame Street

College Green

Church Lane

Trinity College Dublin

Lord Edward Street

Castle Street

Dame Lane

Dame Lane

Molly Malone Statue

Suffolk Street

Jury's Inn Christchurch

Dublin Castle

George's Street

Exchequer Street

Wicklow Street

Nassau Street

Ship Street Little

Ship Street Great

Fade Street

Drury Street

South William Street

Clarendon Street

Duke Street

South Fredrick Street

Brooks Hotel

Chancery Lane

Radisson Blu Hotel

Aungier Street

Grafton Street

Chatham Street

Dawson Street

Molesworth Street

Mansion House

Golden Lane

Whitefriar Street

King Street

Whitefriar Place

Peter Street

St Stephen's Green

The Little Museum of Dublin

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5

Keynote Speakers

DR FRANCESCO AVVISATI, OECD

Francesco is responsible for the analysis of PISA data and has contributed to several PISA reports since he joined the OECD in 2010, including the 2015 report "Students, Computers and Learning: Making the connection". Before joining the PISA team he worked in the OECD Directorate for Education and Skills on the CERI Innovation Strategy for Education and Training project. Francesco Avvisati holds a PhD in Economics from the Paris School of Economics and is an alumnus of the Scuola Superiore Sant'Anna (Pisa, Italy) and of the École Normale Supérieure in Paris. He speaks Italian, French, English and German.

LORD DAVID PUTTNAM

Lord Puttnam is Digital Champion for Ireland, and has had a long-standing involvement in education and the uses of technologies to support teaching and learning. He is a very active working peer in the UK's House of Lords. Among other important roles, he was the first Chancellor of the University of Sunderland, was Chancellor of the Open University, and Chair of the Academic Board for Pearson College (the first major company to offer degrees in the UK).

PROF VAL SHUTE

Val Shute is the Mack and Effie Campbell Tyner Endowed Professor in Education in the Department of Educational Psychology and Learning Systems at Florida State University, USA. Her current research involves using games with stealth assessment to support learning — of cognitive and non-cognitive knowledge, skills, and dispositions.

DR INDRAJIT BANERJEE

As Director of the Knowledge Societies Division of UNESCO in the Communication and Information Sector, Dr Banerjee is responsible for the coordination of UNESCO's overall contribution to the follow-up to the World Summit on the Information Society (WSIS). The Division promotes the application of ICTs to enhance the quality of and access to education, to build scientific knowledge, promote open access to scientific research results, and empower local communities. The Knowledge Societies Division contributes to the implementation of the United Nations Convention on the Rights of Persons with Disabilities and Sustainable Development Agenda. In this regard, UNESCO has undertaken a number of brave initiatives and targeted projects in order to promote disability rights through education, science, culture and communication and information. The Division also promotes free and open source software, open web and open standards, as well as protects and digitises documentary heritage through the Memory of the World Programme. It fosters the role of libraries and archives and is responsible for the further strengthening of the World Digital Library.

DAVIDE STORTI

Davide is a Programme Specialist and YouthMobile Coordinator, in the Knowledge Societies Division, UNESCO. He is the Free and Open Source Software (FOSS) specialist and information knowledge manager in the Communication and Information Sector of UNESCO, and is the lead coordinator of UNESCO's YouthMobile Initiative. He has led for several years the development of UNESCO's information storage and retrieval software CDS/ISIS, used in libraries and documentation centres worldwide. Prior to joining UNESCO, Davide worked as an independent software developer consultant, after his studies in applied informatics.

Sponsored Symposium

**SPONSORED SYMPOSIUM
ORACLE ACADEMY
DIGITAL SKILLS – INDUSTRY & EDUCATION
COLLABORATE
MONDAY 3RD JULY
13:00-14:00
COURTYARD ROOM 1**

The well documented digital skills shortage brings a whole new challenge to ministries for education and educators alike. With a Tech Industry/ Education partnership this challenge can be met together to support educators and ensure students have access to industry led learning. This Symposium explores best practice for collaborations with contributions from industry and education experts with an opportunity to ask questions and explore what the best route is for you.

DCU | **NIDL**
National Institute
for Digital Learning

SPONSORED SYMPOSIUM
DCU INDUSTRY FORESIGHT SESSION
THE GREAT DIGITAL LITERACY DEBATE
TUESDAY 4TH JULY
13:00-14:00
PODDLE ROOM

Set against the conference theme of *Tomorrow's Learning: Involving Everyone*, this special foresight session features a critical and highly relevant debate on the question—what does it mean to be digitally literate in the 21st Century? In addressing this question the debate will challenge many existing digital literacy models and frameworks, and provides an opportunity for conference delegates to engage with differing perspectives on the theme from a number of leading scholars working in the area, including two invited and highly distinguished speakers—Dr. Doug Belshaw and Professor Deidre Butler.

This special foresight session will be relevant to all levels of education and will be both entertaining and highly interactive. The debate will be chaired by Professor Mark Brown, Director of the National Institute for Digital Learning at Dublin City University.

Biography

The National Institute for Digital Learning *NIDL* at Dublin City University *DCU* aims to be a world leader at the forefront of designing, implementing and researching new blended, online and digitally enhanced *BOLD* models of education. *NIDL* staff are highly regarded for their research expertise, postgraduate supervision and considerable experience in the schooling, higher education and adult training sectors. They play major leadership roles in leading academic publications and serve on many national and international professional bodies.

Website: http://www.dcu.ie/nidl

DOCTORAL CONSORTIUM

SEMINAR ROOM
IRISH COMPUTER SOCIETY
87 PEMBROKE ROAD

9:00	RECEPTION	
9.20	OPENING ADDRESS	
		Christine Bescherer
9.30	RONNY SITTER	Math Go: Augmented reality for learning mathematics in an outdoor setting—1
10.00	SHANE BANKS	Our students give us all this data, but do we use it or do we even care?—2
10.30	SEANAN CLIFFORD	How challenges to internationalization of Higher Education manifest in uses of university portals—3
11.00	TEA/COFFEE	
11.20	ALEXANDER BEST	Primary school teachers' views of computer science as a discipline and school subject in primary education—4
11.50	EKATERINA MULDER, MARCUS SPECHT & JOSE JANSSEN	Personal Data and Informed Consent in E-assessment: Legal and Usability Requirements—5
12.20	LUNCH	
13.30	RASHA ESSAM	Exploring AFL teachers' needs using TPACK—6
14.00	MEGAN TRACEY	3D Learning in a Rich Cooperative Haptic Environment—7
14.30	NILS PANCRATZ	Analysing, using and developing Part-Whole-Thinking in Computer Science Education—8
15.00	TEA/COFFEE	
15.20	ANDREAS GRILLENBERGER	Data Management as a Topic for Secondary CS Education—9
15.50	SHARON KEARNEY	Shakespeare, Tablets, and Bridge21: A 21C Approach to Engage Students in English—10
16.20	MAREEN PRZYBYLLA	From Embedded Systems to Physical Computing: Innovations of CS in School—11
16.50	NICKI DABNER	Digital safety and responsible use within a primary school ecosystems community in Aotearoa/New Zealand—12
17.20	CLOSING ADDRESS	
		Christine Bescherer

Programme Monday July 3rd

9.30	WELCOME AND OPENING		
	PLENARY THEATRE	Declan Brady, President, Irish Computer Society, Richard Bruton, Minister for Education and Skills, Don Passey, Chair IFIP WCCE 2017 IPC	
10.00	PLENARY THEATRE	KEYNOTE What does PISA say about digital technologies and skills in schools? AUTHORS: Francesco Avvisati with a foreword from Andreas Schleicher	CHAIR Don Passey
11.30	MORNING BREAK		
12.00	PLENARY THEATRE	SYMPOSIUM From Curriculum Visions To Computer Science and Computational Thinking in the Curriculum in Practice—13 AUTHORS: *Mary Webb, Andrew Fluck, Maciej Syslo, Peter Micheuz, Joyce Malyn-smith, Yousra Chtouki, Margaret Cox, Charoula Angeli, Torsten Brinda, Ivan Kalas & Eleanor Overland*	CHAIR Mary Webb
12.00	BEDFORD HALL 1	DEVELOPING COUNTRIES	CHAIR
		• A Consideration of the Possibility and the Limitation of the Educational Support on Computing and informatics as a Means of Empowering the Disadvantaged Young People in the Developed Country—24 AUTHOR: *Toshinori Saito*	Eric Sanchez
		• Collaborative postgraduate studies in higher education: A case study of South Africa —25 AUTHORS: *Francis M Manzira & Willard Munyoka*	
12.00	COURTYARD ROOM 1	ONLINE TEACHING AND LEARNING	CHAIR
		An educational experience with online teaching—not a best practice—26 AUTHORS: *Ditte Kolbæk & Anne-Mette Nortvig*	Margaret Niess
		Maximizing the teaching and learning potential of adult learners: Applying and using a guided hybrid learning approach —168 AUTHORS: *Jeffrey Hsu & Karin Hamilton*	
12.00	BEDFORD HALL 2	SCHOOL LEARNERS ICT	CHAIR
		• Adolescents' internet attitudes: A study in an experimental Greek secondary school—27 AUTHOR: *Kleopatra Nikolopoulou*	Monica Banzato
		• Shaping Future Digital Citizens in New Zealand Schools: Vision and Challenges—28 AUTHOR: *Nicki Dabner*	

13.00		LUNCH	
13.00	COURTYARD ROOM 1	**SPONSORED SYMPOSIUM** ORACLE ACADEMY DIGITAL SKILLS – INDUSTRY & EDUCATION COLLABORATE The well documented digital skills shortage brings a whole new challenge to ministries for education and educators alike. With a Tech Industry/ Education partnership this challenge can be met together to support educators and ensure students have access to industry led learning. This Symposium explores best practice for collaborations with contributions from industry and education experts with an opportunity to ask questions and explore what the best route is for you.	ORACLE ACADEMY
13.00 – 14.30	PODDLE ROOM	Irish Digital Jobs & Skills Coalition Partner Meeting - closed meeting until 14.00 with delegates welcome to join from 14.00-14.30	CHAIR Mary Cleary
14.00	PLENARY THEATRE	**PRESENTATION & FORESIGHT** • RoboBraille SMART Alternative Media—29 AUTHOR: *Klaus Hoeckner*	CHAIR Peter Micheuz
14.00	COURTYARD ROOM 1	• Construction and Computing in Primary School—30 AUTHOR: *Mike Doyle*	CHAIR Andreas Schwill
14.00	BEDFORD HALL 1	• Teacher's preparation for using ICT—31 AUTHOR: *Dorota Janczak*	CHAIR Lawrence Williams
14.30	PLENARY THEATRE	**SYMPOSIUM** From Curriculum Visions To Computer Science and Computational Thinking in the Curriculum in Practice—13 AUTHORS: *Mary Webb, Andrew Fluck, Maciej Syslo, Peter Micheuz, Joyce Malyn-smith, Yousra Chtouki, Margaret Cox, Charoula Angeli, Torsten Brinda, Ivan Kalas & Eleanor Overland*	CHAIR Mary Webb
14.30	PODDLE ROOM	**SYMPOSIUM** Approaches to teaching "Computer Science" in England and Ireland—32 AUTHORS: *Jake Byrne, Lynne Blair and Kevin Sullivan*	CHAIR Jake Byrne

14.30	BEDFORD HALL 1	PAPERS: EDUCATIONAL MANAGEMENT	CHAIR
		• Information Systems Curriculum in an Australian University: Past Developments and Future Directions—3 6 AUTHORS: *Arthur Tatnall & Stephen Burgess*	Arthur Tatnall
		• The Value of Project Management Education for IT Professionals—3 7 AUTHORS: *Angela Lecomber & Arthur Tatnall*	
		• Development of a Model for Digitally Mature Schools in Croatia—3 8 AUTHORS: *Gordana Jugo, Igor Balaban, Marijana Pezelj & Nina Begicevic Redjep*	
14.30	COURTYARD ROOM 1	PAPERS: MOBILE LEARNING	CHAIR
		• Feature Based Sentiment Analysis for Evaluating the Mobile Pedagogical Affordances of Apps (video presentation)—3 9 AUTHORS: *Muneera Bano, Didar Zowghi & Matthew Kearney*	TBC
		• The use of tablets in secondary schools and its relationship with computer literacy. Does the use of mobile devices matter? —4 0 AUTHORS: *Kerstin Drossel & Birgit Eickelmann*	
		• Determinants of Mobile Learning in Indigenous/Cultural Contexts: The Phenomenon in Canadian First Nations—4 1 AUTHOR: *Ben Akoh*	
14.30	BEDFORD HALL 2	ONLINE TEACHING AND LEARNING	CHAIR
		• Online Teacher Education: Transforming Teachers' Knowledge for Teaching With Digital Technologies —4 2 AUTHOR: *Margaret Niess*	Javier Osorio
		• Blended Learning: the shift to new ways of teaching and learning—4 3 AUTHOR: *Maree Skillen*	
		• Online Laboratory Management: Analysis of the Contribution of Experiential Learning on the Web—4 4 AUTHORS: *Sheila Serafim Da Silva & Murilo Alvarenga Oliveira*	
16.00		AFTERNOON BREAK	
16.30	PLENARY THEATRE	SYMPOSIUM From Curriculum Visions To Computer Science and Computational Thinking in the Curriculum in Practice—1 3 AUTHORS: *Mary Webb, Andrew Fluck, Maciej Syslo, Peter Micheuz, Joyce Malyn-Smith, Yousra Chtouki, Margaret Cox, Charoula Angeli, Torsten Brinda, Ivan Kalas & Eleanor Overland*	CHAIR Mary Webb
16.30	PODDLE ROOM	SYMPOSIUM ICT4D, Education and Sustainable Development Symposium—4 5 AUTHORS: *Nicholas Mavengere & Mikko Ruohonen*	CHAIR Nicholas Mavengere

16.30	BEDFORD HALL 1	PAPERS: EDUCATIONAL MANAGEMENT	
		• Learning in fab labs and makerspaces: Towards a framework for including novice and expert fab lab users in digital fabrication practices—46 AUTHORS: Christos Chytas & Ira Diethelm	CHAIR Maree Skillen
		• What Teachers and Students Know about Data Management—47 AUTHORS: Andreas Grillenberger & Ralf Romeike	
		• Facebook use in Malaysian higher education classroom: An opportunity or challenge?—48 AUTHOR: Cheng Ean Catherine Lee	
16.30	COURTYARD ROOM 1	PAPERS: SOCIAL IMPLICATIONS & INDUSTRY EDUCATION LINKS	CHAIR
		• Experiential Learning: Beyond the Classroom and Connecting with the Industry—49 AUTHOR: Waqar Haque	Kleopatra Nikolopoulou
		• Social Demands in Ubiquitous Computing: Contexts for Tomorrow's Learning—50 AUTHORS: Mareen Przybylla & Ralf Romeike	
		• Gender Difference in Handmade Robotics for Children—51 AUTHORS: Paolo Tosato & Monica Banzato	
16.30	BEDFORD HALL 2	PAPERS: ONLINE TEACHING AND LEARNING	CHAIR
		• Real Time Experiential Learning: a quasi-experimental study—52 AUTHORS: Sheila Serafim Da Silva & Murilo Alvarenga Oliveira	Nicki Dabner
		• Community of Practice : Growth, Change, Transformation and Death: A Literature Review—53 AUTHOR: Shane McMordie	
		• Development of web-based learning scenarios in the semantic web—a connection of didactical aspects and ontological structures—54 AUTHOR: Sven Hofmann	
17.30	END OF DAY'S PROCEEDINGS		
18.00	WELCOME RECEPTION SINDRE RØSVIK, CHAIR OF IFIP TC3 & MIKE HINCHEY, PRESIDENT OF IFIP EXHIBITION AREA		

9.00	PLENARY THEATRE	KEYNOTE	CHAIR
		Stealth assessment—what, why, and how?	Mary Webb
		AUTHOR: *Prof Valerie Shute*	
10.30		MORNING BREAK	
11.00	PLENARY THEATRE	SYMPOSIUM	CHAIR
		Rethinking learning in a digital age: Connecting research, practice, and policy making— **55**	Kwok-Wing Lai
		AUTHORS: *Kwok-Wing Lai, Deirdre Butler, Margaret Leahy, Cathy Lewin, Don Passey, Miri Shonfeld, Peter Twining and Mary Webb*	
11.00	PODDLE ROOM	SYMPOSIUM	CHAIR
		Apps for All: Using tablet technology with child-centered apps to raise learning standards worldwide— **62**	Nicola Pitchford
		AUTHORS: *Nicola J. Pitchford, Paula J. Hubber, Antonie Chigeda, Maria A. Neves & Laura A. Outhwaite*	
11.00	BEDFORD HALL 1	PAPERS: COMPUTING EDUCATION	CHAIR
		• Measuring Learners' Interest in Computing (Education): Development of an Instrument and First Results— **67** AUTHORS: *Torsten Brinda, David Tobinski & Stefan Schwinem*	TBC
		• Large effect size studies of computers in schools: Calculus for Kids and Science-ercise— **68** AUTHORS: *Andrew Fluck, Dev Ranmuthugala, Christopher Chin, Irene Penesis, Jacky Chong & Yang Yang*	
		• A Survey of the Prior Programming Experience of Undergraduate Computing and Engineering Students in Ireland— **69** AUTHORS: *Glenn Strong, Catherine Higgins, Nina Bresnihan & Richard Millwood*	
11.00	COURTYARD ROOM 1	PAPERS: DIGITAL STORIES & PEDAGOGY	CHAIR
		• The King Island Digital Stories (KIDS) Project: Telling Stories for Tomorrow's Learning— **70** AUTHOR: *Jennifer Masters*	Eleanor Overland
		• "Magic" Steps in Writing: The Role of using ICT combined by Self-Regulated Strategy Development— **71** AUTHORS: *Catarina Liane Araújo, António José Osório & Ana Paula Loução Martins*	

11.00		• Involving everyone: Using the "Literacy from Scratch project to develop the Computing and presentation skills of FE students with learning difficulties and disabilities (LLDD students), aged 18 to 24 years, and of their Learning Assistants—**7 2** AUTHORS: *Lawrence Williams & Lloyd Mead*	**CHAIR** Eleanor Overland
11.00		• Peer Affective Factors in Peer Collaboration: Facebook-based Collaborative Writing Activity among Turkish High School EFL Learners—**7 3** AUTHOR: *Hasan Selcuk*	
11.00	BEDFORD HALL 2	**PAPERS: ONLINE TEACHING AND LEARNING**	**CHAIR**
		• Learners' Experiences in a Multicultural Remote Collaborative Learning Environment: A case of ICT4D Course—**7 4** AUTHOR: *Elizaphan Maina, Nicholas Mavengere, Francis Manzira, John Kihoro & Mikko Ruohonen*	Mikko Ruohonen
		• Modelling e-learner comprehension within a conversational intelligent tutoring system—**7 5** AUTHOR: *Mike Holmes, Annabel Latham, Keeley Crockett & James O'Shea*	
		• Online environments as Third spaces for teacher education—**7 6** AUTHOR: *Nicola Carr*	
		• Online Teaching and Communication: Emotions in Computer-Mediated Communication—**7 7** AUTHOR: *Cornelia Connolly, Mayank Singh Parihar & Nicola Marsden*	
13.00		**LUNCH**	
13.00	PODDLE ROOM	**SPONSORED SYMPOSIUM** **DCU INDUSTRY FORESIGHT SESSION** **THE GREAT DIGITAL LITERACY DEBATE** The conference theme of *Tomorrow's Learning: Involving Everyone*, this special foresight session features a critical and highly relevant debate on the question - what does it mean to be digitally literate in the 21st Century? In addressing this question the debate will challenge many existing digital literacy models and frameworks, and provides an opportunity for conference delegates to engage with differing perspectives on the theme from a number of leading scholars working in the area, including two invited and highly distinguished speakers—Dr. Doug Belshaw & Prof Deidre Butler	DCU | NIDL National Institute for Digital Learning **CHAIR** Mark Brown, Director of the *NIDL, DCU*

14.00	PLENARY THEATRE	PRESENTATION & FORESIGHT SESSION	CHAIR
		• Inspiring Tomorrow's Leaders: moving from a Computing to a Digital Media curriculum— 7 8 AUTHORS: *Christina Preston, Bernard Dady & Tracey Ramage*	Andrew Fluck
	PODDLE ROOM	• Digital Schoolhouse powered by PlayStation: Using Play-based learning to inspire the next generation— 7 9 AUTHOR: *Shahneila Saeed*	CHAIR Javier Osorio
	BEDFORD HALL 1	• "ICTs in the Air"— 8 0 AUTHOR: *Pieter Hogenbirk*	CHAIR Sven Hoffmann
14.30	PLENARY THEATRE	SYMPOSIUM Game-based learning and gamification of learning and instruction— 8 1 AUTHORS: *Eric Sanchez, Guillaume Bonvin, Cathy Lewin & Bottino Rosa*	CHAIR Eric Sanchez
14.30	PODDLE ROOM	PAPERS: COMPUTING EDUCATION	CHAIR
		• A Demonstration of Evidence-Based Action Research using Information Dashboard in Introductory Programming Education— 8 5 AUTHORS: *Yoshiaki Matsuzawa, Yoshiki Tanaka, Tomoya Kitani & Sanshiro Sakai*	Toshinori Saito
		• Utilizing the Repertory Grid Method to gain information about learners' perceptions of Computer Science phenomena— 8 6 AUTHORS: *Nils Pancratz & Ira Diethelm*	
		• Computing Camps for Girls – A First-Time Experience at the University of Limerick— 8 7 AUTHORS: *Clare McInerney, Anna-Lena Lamprecht & Tiziana Margaria*	
14.30	BEDFORD HALL 1	NATIONAL DIRECTIONS	CHAIR
		• Digital Tools in Education: Case Finland— 8 8 AUTHOR: *Ritva Savonsaari*	Christine Bescherer
		• Ukrainian Educational Standards in IT field and their link to Professional Standards— 8 9 AUTHORS: *Olena Chaikovska & Tetiana Kovaliuk*	

14.30	COURTYARD ROOM 1	PAPERS: SCHOOL LEARNERS & ICT	CHAIR
		• Towards a framework for developing the emotional intelligence of secondary school students through the use of VLEs—**90** AUTHOR: *Felix Donkor & Rob Toplis*	Ivan Kalas
		• The use of technologies in collaborative learning practices. Secondary school perspective—**91** AUTHOR: *Justina Naujokaitiene & Margarita Tereseviciene*	
14.30	BEDFORD HALL 2	PAPERS: SOFTWARE DEVELOPMENT	CHAIR
		• A Software Development Process for Freshman Undergraduate Students—**92** AUTHOR: *Catherine Higgins, Fredrick Mtenzi, Ciaran O'Leary, Orla Hanratty & Claire McAvinia*	Torsten Brinda
		• Ontology-based Backward Learning Support System—**93** AUTHOR: *Masao Okabe, Masashi Umezawa & Takahira Yamaguchi*	
		• Understanding the Differences Between Novice and Expert Programmers in Memorizing Source Code—**94** AUTHOR: *Matthias Kramer, Mike Barkmin, David Tobinski & Torsten Brinda*	
16.00	COURTYARD ROOM 1	WG3.1 AGM	CHAIR Eric Sanchez
16.00	PODDLE ROOM	WG3.1 AGM	CHAIR Arthur Tatnall
17.00		END OF DAY'S PROCEEDINGS	
19.30		CONFERENCE DINNER MANSION HOUSE	

9.00	PLENARY THEATRE	KEYNOTE Learning with digital technologies is our future AUTHOR: *Lord David Puttnam*	CHAIR Mary Cleary
10.30		**MORNING BREAK**	
11.00	PLENARY THEATRE	SYMPOSIUM Boundary Crossing - Home, School and digital competence—**95** AUTHOR: *Peter Twining, Naima Browne, Neelam Parmar, Steve Harrison, Fiona Henry, Amelia Hempel-Jorgensen & Natalia Kucirkova*	CHAIR Peter Twining
11.00	PODDLE ROOM	SYMPOSIUM ICT and Education interventions in India: Challenges in implementation in government schools—**100** AUTHOR: *Amina Charania, Anil Mammen, Prem Yadav, Girish Harakamani, Babita Majumdar, Panchalee Tamulee, Sohini Sen, Durba Sarkar, Roason Singh, D Shivakumar, Mahesh D.K. & Utpal Medhi*	CHAIR Amina Charania
11.00	BEDFORD HALL 1	SYMPOSIUM eExam symposium - design decisions and implementation experience—**101** AUTHOR: *Andrew Fluck, Hreinn Pálsson, Martin Coleman, Mathew Hillier, Daniel Schneider, Gabriele Frankl & Kristiina Uolia*	CHAIR Andrew Fluck
11.00	COURTYARD ROOM 1	PAPERS: SOFTWARE DEVELOPMENT • Error Recognition Model: End-user Text Management—**107** AUTHOR: *Mária Csernoch and Piroska Biró* • Measuring shortly mobile phone dependence in high schools: A cross-national validation in Spanish and Greek—**108** AUTHOR: *Olatz Lopez-Fernandez and Kleopatra Nikolopoulou* • Innovations in Teaching and Learning in Higher Education using Haptic Simulators for Dental Students and other Health Care Disciplines—**109** AUTHOR: *Margaret J. Cox, Barry F. Quinn, Jonathan P. San Diego, Jesal Patel, Kiran Gawali & Mark Woolford* • Agile development in software engineering instruction—**110** AUTHOR: *Jaana Holvikivi and Peter Hjort*	CHAIR Hasan Selcuk

11.00	BEDFORD HALL 2	PAPERS: TEACHER EDUCATION ICT	CHAIR
		• DIY Lab as a way how student teachers can understand a learning process—111 AUTHOR: *Miroslava Cernochova, Tomas Jerabek & Petra Vankova*	Lawrence Williams
		• Informatics teachers' self-efficacy - a survey instrument and first results—112 AUTHOR: *Claudia Hildebrandt*	
		• Scaling a model of teacher professional training—Can we recreate deep learning conversations live online?—113 AUTHOR: *Deirdre Butler, Margaret Leahy, Michael Hallissy and Mark Brown*	
13.00		LUNCH	
13.00	PODDLE ROOM	SPONSORED SYMPOSIUM SOLAS	CHAIR TBC
13.00	COURTYARD ROOM 1	AUTHOR DROP-IN SESSION Opportunity to discuss your paper with a lead editor	CHAIR Mary Webb
14.00	PLENARY THEATRE	PRESENTATION & FORESIGHT SESSION Developing the TEL Framework for FET – The Story so Far—114 AUTHOR: *Carol McCarthy and Michael Hallissey*	CHAIR Yoshiaki Matsuzawa
14.30	PLENARY THEATRE	PRESENTATION & FORESIGHT SESSION The Micool Project – a shared perspective on deploying mobile technologies in European Schools—115 AUTHOR: *Miriam Judge*	CHAIR TBC
14.30	BEDFORD HALL 1	NATIONAL DIRECTIONS Computer Science for the Irish Leaving Cert - Progress and Challenges	CHAIR Mary Cleary
15.00	PLENARY THEATRE	KEYNOTE YouthMobile – an initiative to support developing countries AUTHOR: *Davide Storti*	CHAIR Andrej Brodnik

Programme Wednesday July 5th

16.00	PLENARY THEATRE	SYMPOSIUM Bridge21 - a pragmatic approach to 21C teaching & learning—**116** AUTHOR: *Brendan Tangney, Kevin Sullivan, Sharon Kearney & Michelle O'Kelly*	CHAIR Brendan Tangney
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		• Effects of Performance Transparency in a Mathematics E-Learning Application: Evidence from a Randomized Controlled Trial—**117** AUTHOR: *Daniel Schunk, Henning Mueller, Franz Rothlauf & Martin Huschens*	Christina Preston
		• Integrating a learner portfolio into Junior Cycle French: a case study from the Republic of Ireland—**118** AUTHOR: *Triona Hourigan and Ann Marcus-Quinn*	
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		• Computer-based Working Memory Training in Primary Schools: Evidence from a Large-Scale Randomized Controlled Trial—**120** AUTHOR: *Kirsten Winkel, Daniel Schunk, Eva Berger, Henning Mueller & Ernst Fehr*	
16.00	COURTYARD ROOM 1	SHORT PAPERS: COMPUTING EDUCATION	CHAIR
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		• Creative Coding with Scratch: Presentation of the pilot project in primary school—**122** AUTHOR: *Nadia Wasif*	
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		• Student Retention: Towards defining measures for improved quality of teaching and learning in the first year of computer science studies—**123** AUTHOR: *Bernhard Standl, Elisabeth Wetzinger & Gerald Futschek*	Jaana Holvikivi
		• Relation of Reading Literacy and Frequency of Internet Use: Analysis based on PISA 2015—**124** AUTHOR: *Ramona Lorenz, Manuela Endberg & Wilfried Bos*	
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		Developing OERs—implications for future use	Sindre Røsvik
		AUTHOR: *Indrajit Banerjee*	
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		AUTHOR: *Niki Davis, Cathy Lewin, Christina Preston, Jo Fletcher, Julie Mackey, Letitia Fickel, Una Cunningham, Leona Harris and Sarah Younie*	
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		• Involving Everyone: Coding and Decoding Languages—**127**	
		AUTHOR: *Therese Keane, Monica Williams, Christina Chalmers & Marie Boden*	
		• A Social Constructivist Approach to Computer Science Teacher Professional Development – the Bridge21 CPD Approach—**128**	
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		• Algorithms and Programming: Spreadsheets, CAS, Flowcharts and Flowgorithm—**129**	
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		• Computational Thinking in Primary Schools: Theory and Causal Models, (Short Paper)—**131**	
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		• Learning analytics and perceived self-efficacy: Case study at Danish schools, (Short Paper) —**132**	
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		• 3D printing integration in the classroom: Overview of a project in the UAE primary schools, (Short Paper)—**134**	
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		• Motion detection devices on elderly physical activity (Short Paper)—138 AUTHOR: Marcelo Brites-Pereira, Maria João Almeida & António J. Osório	
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		• Activation of Computer Science Teachers in Slovenia (Short Paper)—140 AUTHOR: Nataša Mori, Matija Lokar & Andrej Brodnik	Steve Kennewell
		• Enhancing Learning in a Virtual Environment (Full paper)—141 AUTHOR: Nicholas Mavengere, Mikko Ruohonen & Katriina Vartiainen	
		• Augmented Reality as a Tool for Authentic Learning of Clinical Skills in Early Years of Medical Training (Full paper)—142 AUTHOR: Arkendu Sen, Calvin L. K. Chuen, Shiang Harn Liew & Aye C. Z Hta	
		• Understanding the best way to embed ICT in teacher education (Full paper)—143 AUTHOR: Amber McLeod & Kelly Carabott	
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		Initiatives to Promote and Develop Students' Computing Skills—145 AUTHOR: Frank Mockler	Frank Mockler
14.30	PODDLE ROOM	SYMPOSIUM	CHAIR
		Optimising the use of Learning Technologies in Science Education: A Graduate School of Education Approach—151 AUTHOR: Christine Redman, Joanne Blannin, Duncan Symons & Cheryl Jakab	Christine Redman
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14.30	BEDFORD HALL 1	Konnecting: a mobile game to introduce freshmen to the evolution of communication, (Full Paper)— 1 5 7 AUTHOR: Ana A. Carvalho	CHAIR Eric Sanchez
		Game-play: Effects of online gamified and game-based learning on dispositions, abilities and behaviours of primary learners, (Full Paper)— 1 5 8 AUTHOR: Jawaher Al Ghamdi & Charlotte Holland	
		For ARGument's Sake! The pros and cons of Alternate Reality Gaming in Higher Education, (Short Paper)— 1 5 9 AUTHOR: Katerina Economides	
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		• eExams: Strength in diversity— 1 6 0 AUTHOR: Andrew Fluck & Mathew Hillier	
		• Technology and Formative Assessment - Affordances & Considerations— 1 6 1 AUTHOR: Monica Ward	
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		• Designing Assessment For Blended Learning Scenarios: A Decision Support Tool— 1 6 3 AUTHOR: Mary Webb, Stylianos Hatzipanagos, Jonathan San Diego, Ehsan Khan & Mateusz Goral	
14.30	BEDFORD HALL 2	PAPERS: COMPUTING EDUCATION	CHAIR Robert Gajewski
		• How Can We Make Computing Lessons More Inclusive?— 1 6 4 AUTHOR: Chris Shelton	
		• Constructive Interaction on Collaborative Programming: Case Study for Grade 6 Students Group— 1 6 5 AUTHOR: Sayaka Tohyama, Yoshiaki Matsuzawa, Shohei Yokoyama, Teppei Koguchi and Yugo Takeuchi	
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16.00	CLOSING SESSION	*Don Passey, Chair of IFIP WCCE 2017 IPC, Denise Leahy, Chair of IFIP WCCE 2017 LOC, Sindre Røsvik, Chair of IFIP TC3, Mike Hinchey, President of IFIP*	
	END OF CONFERENCE PROCEEDINGS		

Social Programme

WELCOME RECEPTION — 3rd July 2017

DUBLIN CASTLE

The WCCE welcome reception will take place at the Printworks in Dublin Castle. This will allow delegates the opportunity to make acquaintance and catch up with old friends in a relaxed environment

Start Time: 18:00

Dress Code: Smart Casual

GALA DINNER — 4th July 2017

THE MANSION HOUSE DUBLIN

The WCCE gala dinner will take place in the Round Room at the Mansion House. On this night delegates will be treated to a sumptuous meal, in the unique setting of the home of Dublin's Lord Mayor, which will prove to be a memorable experience for all.

Tickets for the gala dinner are included in the registration fee. Additional tickets can be purchased at the registration desk at a cost €100 per person.

Dress Code: Smart Casual

Start Time: 19:30

Transport: Delegates to make their own way to the Mansion House

OPTIONAL EVENING 1 — 5th July 2017

VIKING SPLASH TOUR AND RECEPTION

Viking Splash Tour will take you on a 1 hour and 15 minute fully guided tour of the main sights in Dublin city centre and also a splash into the water at the Grand Canal Basin. The tour is followed by a food and drink reception in The Church Restaurant, a 300-year-old restored church in the heart of Dublin.

Max Capacity: 100pax

Cost: €65PP

OPTIONAL EVENING 2 — 5th July 2017

DUBLIN LITERARY PUB CRAWL

Local culture and literary buffs on a tour of Dublin's most famous historical pubs for a pint of Guinness or whatever takes your fancy! Actors will entertain delegates with a comic flavour in and around a typical Irish setting, the Dublin pub.

Cost: – €30PP *Please Note: this tour is full*

REGISTRATION & ASSISTANCE

The IFIP WCCE 2017 Registration and Information Desk is located in the Printworks Building in Dublin Castle, Dame St, Dublin 2

REGISTRATION & INFORMATION DESK OPENING HOURS:

Monday	3rd July	09.00 – 17.00
Tuesday	4th July	08.30 – 17.00
Wednesday	5th July	08.30 – 17.00
Thursday	6th July	08.30 – 16.00

Our trained staff at the registration/ information desk will be available to offer advice and answer any queries you have on aspects of the conference or general information relating to your stay in Dublin.

IMPORTANT NUMBERS

Registration, accommodation, tours, social programme.

CONFERENCE ORGANISER:

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NAME BADGE

Your personal name badge is your entrance ticket into all conference sessions and contains tickets to the social events you have registered for. Please wear this badge at all times. No badge, no entry!

SMOKING POLICY

Smoking is not allowed inside the conference venue.

CERTIFICATES OF ATTENDANCE

Certificates of Attendance are emailed out following the conference from wcce2017@ conferencepartners.ie. If you require a stamped receipt or certificate of attendance please ask at the registration desk.

WIFI

Delegates can avail of complimentary WiFi in Dublin Castle Printworks. The password will be available on screens throughout the conference venue.

Local Information

AN EXTENSIVE PUBLIC TRANSPORT NETWORK SERVES DUBLIN

LEAP CARD

A Leap Card is a reusable plastic smart card that can be used instead of paper tickets to pay-as-you-go for transport in Dublin. You pay less with a Leap Card than when you pay for single fares with cash on Dublin Bus, LUAS, DART and Commuter Rail Services. A €5 fully refundable deposit is charged for adult Leap Cards. When buying your Leap Card you must also top it up with a minimum of €5 travel credit. There are over 400 Leap Card agent shops around Dublin where you can buy or top up a Leap Card.

DUBLIN BUS

Dublin Bus provides an extensive network of buses serving Dublin city and the suburbs. Dublin Bus tickets can be purchased on the buses, and at shops displaying the Dublin Bus logo. Please note that buses accept euro coins only and you must have the exact fare as Dublin Bus drivers do not take bank notes nor give you any change. For timetables, fares, journey planner and real time bus information, see www.dublinbus.ie. The Dublin Bus iOS App (free) or Dublin Bus Android App (free) provide real time bus information to your smart phone.

LUAS

Luas is a state-of-the-art Light Rail transport system in Dublin. The Luas provides passengers with a high capacity service that is fast, frequent and reliable. There are convenient stop locations, excellent levels of comfort, safety and accessibility. There are two Luas lines in Dublin: the Red Line which operates in the north side of Dublin, and the Green Line which operates on the south side of Dublin. Tickets are available from every Luas terminal.
Fare types are available at: http://www.luas.ie/tickets-and-fares/

DUBLIN BIKES

Dublin Bikes is a self-service bike rental system open to everyone from 14 years of age. With 40 stations and 450 bikes, it enables you to travel through the city centre, and get out and about to enjoy Dublin city at your leisure. All stations are equipped for Long Term Hire Card and 3 Day Ticket Users. 14 of the 40 terminals allow you to purchase a 3 day ticket. Once purchased, you can use the 3 day ticket similar to the Long Term Hire Card to rent or return a bike from any station in the network. You can enjoy the many benefits of a Long Term Hire Card for just €10. A 3 day ticket costs €2. The first 30 minutes of use is free on every Dublin Bike. For details, see www.dublinbikes.ie.

TOURIST INFORMATION

For recommendations on things to do in Dublin, download the Visit Dublin App to your iPhone or Android device and explore Dublin from the palm of your hand! Alternatively, visit www.visitdublin.com.

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2017

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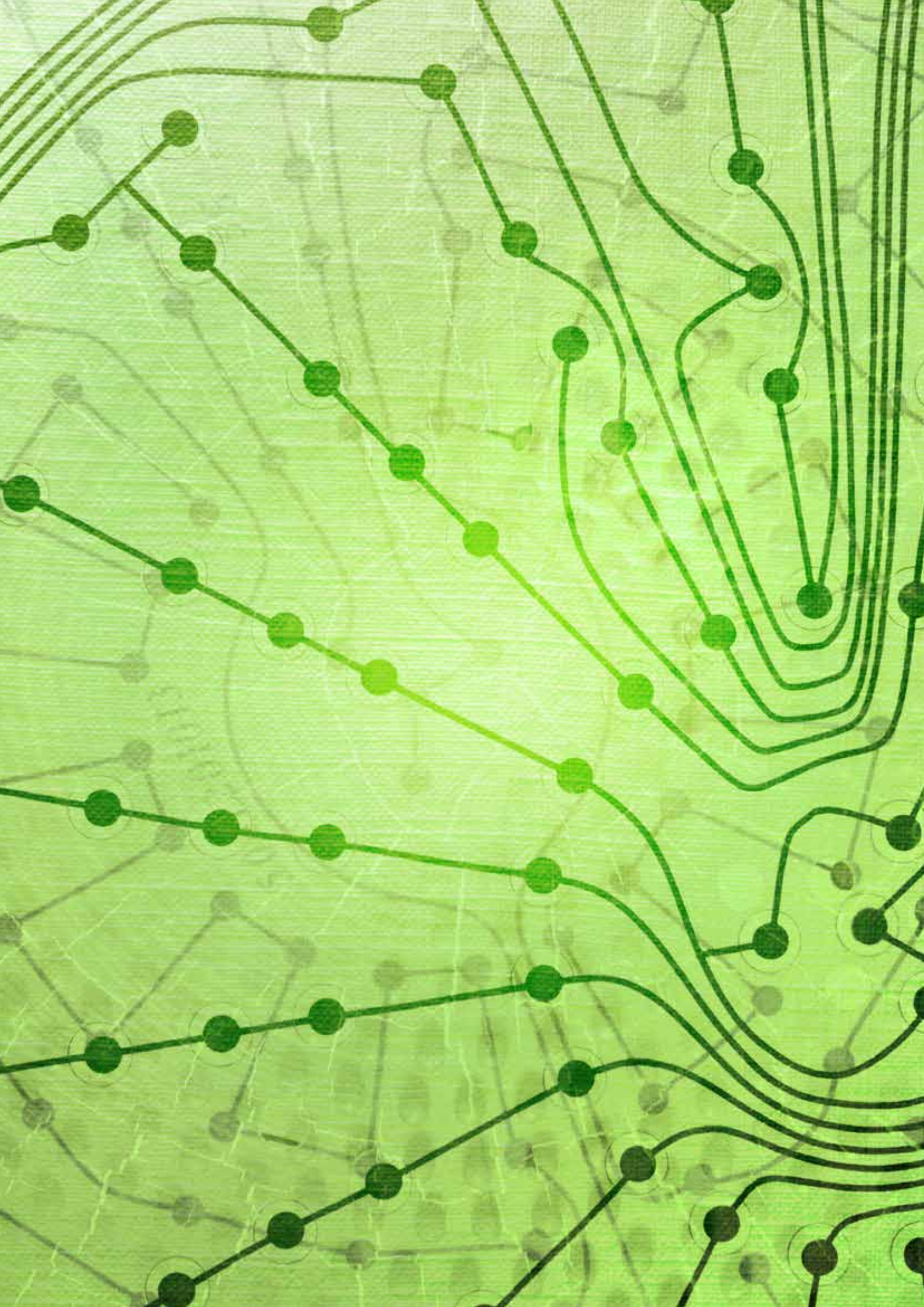
BOOK OF ABSTRACTS

Sunday 2nd July 2017
DOCTORAL CONSORTIUM
IRISH COMPUTER SOCIETY
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Monday 3rd – Thursday 6th July 2017
THE PRINTWORKS
DUBLIN CASTLE

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Edited by Don Passey and Nicholas Mavengere

Math Go: Augmented reality for learning mathematics in an outdoor setting

Ronny Sitter

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Abstract

In this dissertation project the author plans to produce and evaluate a prototype augmented reality app that provides a learning opportunity for children at primary level and beyond. The mathematical tasks are set in an out of classroom environment. AR 3D visualizations of mathematical context will be accurately placed over real-time camera images of a tablet to support the learner's development of size perception and a sense of proportion. The AR software will work markerless so it can be used in a flexible way in an outdoor setting.

AR apps are quite new, especially in the field of learning [1], and provide new ways for handling information. The concept aims i.a. at utilizing its novelty and playful aspects for motivational purposes. Furthermore, the fast development of technology in this field gives more and more possibilities to discover.

The emerging topic of AR in education is still not even rudimentarily covered yet and therefore needs more research that is fundamental. On this account, the author plans to evaluate the app in an explorative design with usage protocols, technical supported observations and qualitative interviews. The question is if and how can it influence mathematical thinking and enhance motivational and emotional learning conditions.

Keywords

Augmented reality – mathematics – learning - primary school - outdoor.

References

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Our students give us all this data, but do we use it or do we even care?

Shane Banks

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Abstract

This study investigates the extent to which the knowledge and use of the data trial left by students in the VLE impacts on the reflective practices of higher education lecturers. This paper presents findings that show that among lecturers in this study there is a strong awareness of the data collected by the VLE. This data is seen as important but despite a willingness to use and interrogate this data in a reflective manner there appears to be a lack of knowledge among lecturers as to how to do this effectively. There is a strong recognition of the role this data could play in the retention strategies of higher education institutions, in particular with first year students.

Keywords

Data Analytics · Reflective Practices · VLE · Retention

Book of Abstracts

How challenges to internationalization of Higher Education manifest in uses of university portals

Seanan Clifford

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Abstract

This study investigates what opportunities and barriers there are to using a university portal by international faculty (non-South Korean faculty), in Daegu, South Korea, how the portal is valued and used by the international faculty and how the portal can be improved. Findings show that this portal has significantly more barriers for international faculty than opportunities in relation to the following five heuristics; ease of use, access and availability of information, feelings of connection, support for professional practice and training. To overcome these portal barriers, a number of international faculty suggestions and strategies concerning: translation, relevance, training & documentation, functionality and design are discussed.

Keywords

University portal · barriers · usability · international faculty · South Korea

Primary school teachers' views of computer science as a discipline and a school subject in primary education

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Abstract

This paper describes the design and aims of the research project Informatics in Primary Schools. One of the project's goals is to gather, structure and understand primary school teachers' views on computer science, both as a discipline and a subject in primary schools. This includes their opinions, attitudes, knowledge as well as expectations and doubts. The project's design relies on qualitative research methods and techniques, such as Mayring's Qualitative Content Analysis [1] or guided interviews. The long-term goal of the project is to aid in developing teacher training concepts as well as classroom materials, which feature a bottom-up approach in order to suit the needs and prerequisites of primary school teachers in Germany.

Keywords

Computer science · primary schools · primary education · primary school·teachers' views · qualitative research

References

1. Mayring, P.: Qualitative Content Analysis. Forum: Qualitative Social Research. 1(2) (2000) urn:nbn:de:0114-fqs0002204

Book of Abstracts

Personal data and informed consent in e-assessment

Ekaterina Mulder[1], Dr. Jose Janssen[2], Prof. Dr. Marcus Specht[3]

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Abstract

Informed consent in relation to personal data use is becoming a more relevant topic than ever. Recent figures indicate that even if people find it important to protect their personal data, only 20% pay attention to the details of requests for personal data use before giving their consent [1]. This is of particular concern with respect to use of personal data in sensitive areas like health or educational assessment.

This research will: (1) review current practices of informed consent in e-assessment; (2) identify legal requirements and user needs regarding informed consent procedures in e-assessment; (3) develop a protocol and a tool for informed consent in e-assessment; (4) evaluate the protocol and the tool in formative and summative studies to increase usability.

The methodology will include a literature review, quantitative and qualitative studies. Phase I "Initial requirements and analysis" will include a literature review and a focus group interview to establish requirements. In phase II "Initial design and qualitative evaluation" we will develop a mock-up protocol that will be tested following a think-aloud protocol. In phase III "Redesign and quantitative evaluation" an adapted version of the protocol and the tool will be evaluated on a larger scale through an online survey.

Keywords

Personal data · informed consent · e-assessment

References

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Exploring AFL teachers' needs using TPACK

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Abstract

Instructors of Arabic as a foreign language (AFL) in an American university in Cairo are still resistant towards integrating technology in their teaching although the university provides different sources of technology trainings. To know the reasons behind that resistance, this study is conducted. Therefore, the main purpose is to explore the forms of knowledge which AFL teachers prefer their trainers to have to help them integrate technology effectively in their teaching. Design-based research methodology limited to a needs analysis phase was used for conducting this study. Semi-structured interviews with visuals was used as a data collection method. Technological pedagogical and content knowledge framework (TPACK) was used as a guide for formulating the research question and designing the semi-structured interviews. The findings showed that content knowledge is what would influence teachers to prefer some particular trainers. The findings could benefit technology-training designers by taking into consideration teachers' needs before conducting any training to have effective outcomes. Policy makers in higher education could also benefit from this study by knowing that the trainers' knowledge about the subject domain of teachers is essential for having effective technology-trainings and therefore they have to change their policies in order to reach better objectives.

Keywords

TPACK · Training · Design-based research · Education

3D Learning in a Rich Cooperative Haptic Environment

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Abstract

This paper discusses the aims and rationales for developing the use of haptics for learning cell biology in secondary schools. The paper considers issues in the conceptual understanding of cell biology and how a 3D haptic environment could aid learning by providing students with opportunities to hypothesise and explore complex scientific concepts.

Haptics, virtual reality and 3D representations have been shown to support visualisation[1], a skill which is crucial for science learning[2]. Theoretical support for improved learning associated with haptic support for visualisation is provided by Dual Coding Theory[3] and Cognitive Load Theory[4], which suggest that utilising the haptic sense may allow for more effective processing of complex information. Cell biology may benefit especially from the use of haptics due to its difficulty and common misconceptions[5].

Pilot testing has guided design improvements for the main study, where a haptic system will allow interaction with a 3D virtual cell membrane in haptic-visual, visual-only and control conditions. Knowledge gain will be measured with a pre- and post- intervention test, and interviews will provide qualitative data on the students' experiences. It is expected that a haptic-visual condition will yield greater knowledge gains. Next steps and current issues for this project are also discussed.

Keywords

Haptics · Education · Secondary · Biology · Virtual Reality

References

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Analysing, Using and Developing Part-Whole-Thinking in Computer Science Education

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Abstract

Life Long Learning involves everyone in our rapidly expanding *Digital World*. Due to the rash change in IT, *Thinking Skills*, which enable learners to obtain further knowledge by themselves in both their future personal and working lives, become increasingly important. However, the focus of most school subjects (including Computer Science) lies on conveying content so far instead of equipping students with essential *Thinking Skills* [3]. These skills include the talent to build cognitive structures and thereby (often subconsciously) identifying and understanding relevant relationships [2] like part-whole-relations: They help understanding objects, systems, processes, definitions and concepts [3]. We organize our knowledge in conceptual hierarchies by subconsciously questioning ourselves, which parts various objects are made of [4]. This knowledge about the parts and their relationships is the fundament of our views on the functionalities and principles of complex objects and systems [1].

Without a doubt many IT devices, systems, and concepts make use of part-whole-relationships: E.g. the Internet consists of many different servers, clients, and routers; Computers have processing units, graphic cards, motherboards, memory, and storage units; algorithms are composed of an infinite amount of well-defined steps; relational databases consist of various tables or relations. Since students can only learn on the basis of their preconceptions, these pre-understandings of important part-whole-relationships of all these CS concepts need to be picked up in Computer Science classes and teaching materials. Therefore, a profound analysis of novice learners' part-whole-thinking is needed, to be able to take these conceptions up afterwards. The approach of my work (which is about analysing Computer Science novices' part-whole-thinking) shall handle these questions and research gaps.

Keywords

part-whole-thinking · cognitive hierarchies · learners' preconceptions · life long learning · Computer Science Education

References

1. Gerstl, P., Pribbenow, S.: Midwinters, end games, and body parts: a classification of part-whole relations. International Journal of Human-Computer Studies 43(5), pp. 865-889 (1995)
2. Presseisen, B.Z.: Thinking Skills: Meanings and models revisited. In: Costa, A.L. (ed.) Developing Minds, pp. 56-62. Volume 1, Association for Supervision and Curriculum Development, Alexandria, Virginia (1991)
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Bringing the Innovations in Data Management to Secondary CS Education

Andreas Grillenberger

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Abstract

The field data management has changed significantly with the innovations in recent years. Central topics of this field, like "Big Data", bring new requirements for the collection, storage and processing of data. With such developments, data management evolved from the traditional topic databases. While databases and the relational data model are central to typical secondary computer science education, the changes in the last 10-15 years have hardly been investigated from a CS education perspective. However, several aspects of this topic have a high impact in our daily lives: with the increasing relevance of data and data analyses, everyone needs to develop key competencies for responsibly handling own and others' personal data.

In this research project, the main aim is to investigate the field data management from a CS education perspective in order to evaluate which aspects are suitable for secondary CS teaching. To ensure an emphasis on the long-lasting aspects of this field, one of the main tasks is finding the central principles of this field. In addition to the scientific perspective on data management, also the teachers' and students' perspectives will be investigated and considered.

Keywords

data management · central principles · key competencies · big data

Shakespeare, Tablets, and Bridge21:
A 21C Approach to Engage Students in English

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Abstract

21st century (21C) information and communication technologies (ICTs) have created both a need to teach students "new literacies" and an opportunity for engaging students in the process of learning conventional English skills and content. However, it remains unclear how to effectively incorporate ICTs into teaching and learning in the second-level English context. This presentation reports on an adaptation of the Bridge21 pedagogical model – a technology-mediated, team/project-based approach to teaching and learning – to English.

The study used an embedded multiple-case study methodology. This presentation focuses on one aspect of the research: the implementation and evaluation of the Bridge21 model for teaching Shakespeare. Four, one-week long case studies, involving second-level (ages 15-16) students (n=73) from 6 schools were implemented. Qualitative and quantitative methods were used to collect and analyze data. Results demonstrate an increase in students' engagement and confidence in English after participation in the Bridge21 learning intervention. Increased engagement was attributed to the following: a sense of learning (skills/content), the style of learning, teamwork, and using technology. Participants also reported feeling more confident in: interpreting Shakespeare, using technology, working collaboratively, researching, and public speaking. These results suggest the Bridge21 approach could be an effective way to integrate ICT into English teaching.

Keywords

21C Teaching and Learning · second-level-English-education · Bridge21 · technology-enhanced-learning

Book of Abstracts

From Embedded Systems to Physical Computing: Innovations of CS in School

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Abstract

Today, more than 98% of all microprocessors are integrated in technical devices such as pace makers, navigation systems or household devices [1]. Embedded systems are the technological basis for many application areas, e. g. robotics or wearable computing and disciplines like physical computing or interaction design. Especially physical computing has potentials to offer state-of-the-art CS education. Thus, this research project examines its opportunities and how these can be used in CS education.

A structured analysis of scientific literature on related technologies identified commonalities and core concepts (e. g. sensing and actuating, control and regulation, continuity and discreteness).

From a didactic point-of-view, also students' and teachers' perspectives and social demands are considered using the model of educational reconstruction [2]. This helps to find interesting and relevant contexts, e. g. automated light control in smart homes or individualized pricing in grocery stores.

For the last four years, I conducted workshops and accompanied teachers in different physical computing projects. This approach is similar to design-based research in that it involves iterations to create and constantly refine design principles and best practice examples for lessons and courses. Eventually, teaching guidelines and evaluated settings, activities and examples will be available for classroom use.

Keywords

Computer science · education · embedded systems · physical computing · educational reconstruction

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Symposium: From Curriculum Visions to Computer Science and Computational Thinking in the Curriculum in Practice

Presenters: Mary Webb[1] (chair), Peter Micheuz[2], Torsten Brinda[3], Eleanor Overland[4], Joyce Malyn-Smith[5], Ioannis Ioannou[6] & Charoula Angeli[6], Ivan Kalas[7], Andrew Fluck[8], Maciej Syslo[9], Yousra Chtouki[10]

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Introduction

This symposium builds on a series of meetings and symposia at TC3 conferences led by the IFIP TC3 Curriculum Task Force and EDUsummIT 2015. The work originated from concerns across many countries about the need for curriculum change in Computer Science. A report based on this work [1] was presented to IFIP General Congress in 2016. In this symposium we aim to take forward this work by addressing the following questions:

1. How has Computer Science been incorporated into the curriculum in various contexts and what are the rationales for these decisions?
2. What frameworks can support the development and implementation of Computer Science curricula?
3. How can computational thinking, as an important element of Computer Science in practice, but which also has wider application and implication, be developed and consolidated within Computer Science curricula and wider curricula contexts?
4. What is the relationship between computational thinking, digital and other literacies and Computer Science?
5. What are the major issues affecting implementation of new curricula for Computer Science including relationship with other curriculum areas, student motivation, pedagogical approaches?

The outcome of the symposium is expected to be a report further clarifiying issues regarding curriculum design, implementation and associated pedagogical considerations.

Keywords

Computer science · curriculum · computational thinking · pedagogy · digital literacy

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Book of Abstracts

Computer Science in the school curriculum: issues and challenges

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Abstract

This paper will outline findings and recommendations from work of the IFIP TC3 Task Force: "Curriculum-deeper understanding of roles of CS/Informatics" as well as that of EDUsummIT Thematic Working Group 9. The situation of the curriculum for Computer Science varies between countries. In some, e.g. Cyprus, Poland and Israel, Computer Science has existed as a curriculum subject for many years. For others the curriculum for Computer Science has recently been substantially revised after a period of neglect followed by calls for reform. Even in those countries where Computer Science in the curriculum has a long history, there are differences in approach and in the importance of various factors that affect curriculum design and implementation. Our analysis and discussion, based on examination of curriculum change in ten countries, as well as a review and content analysis of curriculum reports, led to a rich range of issues and considerations and a set of questions.

In a report based on this work [1] and an updated version in July 2016 a number of challenges for Computer Science in the school curriculum were identified and recommendations were made to policymakers, practitioners, industry leaders and researchers.

Keywords

Computer science · curriculum · computational thinking · pedagogy · digital literacy

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Austrian Schools on the Way to a
Sustainable Basic Digital Education for All

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Abstract

After nearly 30 years of a non-binding nature of digital coverage in Austrian schools at lower secondary level, the year 2017 seems to mark the transition to accountability in the form of a national curriculum for a new subject called Basic Digital Education. Recently, a curriculum has been developed and will be piloted in some schools within the ministerial initiative eEducation. This curriculum covers all four years of lower secondary education and entails digital-, Informatics- and media competences. It consists of the topics Social Aspects of Media Change and Digitization, Information-, Data- and Media competence, Office Applications, Media design, Digital Communication and Social Media, Security Issues, Technical Problem Solving and Computational Thinking. As all the years before, it is still up to the schools to implement the curriculum in the proposed subject Basic Digital Education and/or within other existing subjects. In order to assure that all pupils will meet the requirements of the curriculum and its intended competences at the end of lower secondary education, there will be a quality assurance check. With this and other accompanying measures, a first important planning step in Austria is done. But the challenges for a veritable success of "Basic Digital Education for All" lie ahead.

Keywords

Curriculum · Competence · Informatics · Digital Literacy · Media Literacy

Book of Abstracts

Timely updates for Computer Science curricula

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Abstract

New computing-style curricula adopted by many countries since 2014 are predicated on the underlying concepts of binary arithmetic and procedural algorithms. Given this recent adoption of computer science for schools, what are the arguments for suggesting changes to the subject?

One powerful argument is the availability from May 2016 of an open accessible quantum computer (IBM, 2016). It provides anyone with an internet connection access to a five-qubit quantum computer, together with training materials, a programming environment and a simulator. Students accessing this resource will encounter a dramatic alternative to binary logic because a qubit can have both horizontal and vertical polarization.

This non-algorithmic, non-binary form of computing is now available and expected to provide significant advantages over more traditional forms. From a curriculum perspective, how urgent is it school students encounter such an alternative? The current availability of a quantum computer makes this a more pressing question, but the dramatic difference from mainstream coding activities would make teachers and curriculum designers reluctant to adopt.

To adapt to this kind of innovation, it would seem prudent for curriculum designers to at least reserve a substantial part of the final year of compulsory schooling in computing for emergent technologies. Teachers will need suitable update materials annually. Such an approach can provide an opportunity for the emergence of new workers in these critical areas, and provide a wider community understanding of their social implications.

Keywords

Computer science · school education · quantum computing · curriculum

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On the Discussion of Mandatory Computing Education:
What are the Arguments?

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Abstract

The increasing spread of technology based on digitization has led to a broad and ongoing discussion on the consequences that education must draw. Educational strategies are being discussed around the world, aimed at preparing young people as best as possible for the challenges of the so-called "digital world". There is a broad agreement that learning with digital media must lead to a transformation of school education, but there is much debate about the importance of computing education for all pupils.

In Germany, a strategy document on education in the digital world was published in 2016 by the National Board of the Federal Ministers for Education. On about 60 pages the document focused on digital media competency and innovation of the education system, but there was no explicit inclusion of a computing subject into an overall conception, although in the drafting process this lack was commented by various actors.

To gain an insight into the worldwide discussion, various documents (scientific papers, political documents, blog entries) were examined by means of a qualitative content analysis according to Mayring for advocating and rejecting arguments for a mandatory computing subject at K12 level. This paper summarizes the research process and results.

Keywords

Computer education · K12 · arguments · mandatory subject · qualitative content analysis

The prioritisation of classroom activity and resources in the teaching of computing: A study into the development of student teachers of computing in England

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Abstract

The computing curriculum in English secondary education is in its third year of implementation and has grown in prevalence and status within English schools. During placements in schools, student teachers have experienced variations of computing subject knowledge of pupils and teachers, availability of resources and curriculum structure [1]. During the last three years, there has been a noticeable shift in delivery and resourcing of computing in schools and student teachers have been able to adapt their practice and priorities as a result. This is a three-year study comparing three different student teacher cohorts and how they have viewed and implemented approaches in the classroom such as group work, physical computing, 'unplugged' activities and programming. Using images as a stimulus, this study has explored student teachers' views and personal priorities in delivering the computing curriculum. The students have developed a visual hierarchy of the images which most represent their values and practice in teaching computing [2]. The use of images has allowed the dialogue to move away from the restrictions of terminology whilst generating self-reflection and debate. The three year comparison shows only minor change in priorities of the student teachers in the pedagogical processes of teaching computing.

Keywords

Computer science · computing · secondary · student teachers · visual research methods

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Implementing computer science curriculum
in schools in Poland – issues, challenges, and practice

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Abstract

A new national curriculum for all subjects including computer science (CS) in primary schools K-8 has been approved by the Ministry of National Education in the mid of February 2017, and a new curriculum for secondary schools will be ready in 3-4 months. The new CS curriculum will take effect from September 1, 2017. The general construction and building blocks of the CS curriculum are described in [1].

There are a number of challenges and open questions regarding the implementation of the new CS curriculum in schools. How to motivate and engage students to learn/study/use/develop CS knowledge, skills, and competencies through K-12 is one of the main challenges. As a sample answer to this question we will describe a sequence of consecutive students' activities through 12 years of CS education on topics related to sorting and searching information – such topics are present in almost all CS curricula over the World.

Then we will restrict our attention to the initial education in K-3 stages, when the main focus is on integrating all "educations": literacy, numeracy, informatics (CS), science, arts, technology, and also physical education. We will present a virtual environment for supporting students and teachers in learning and teaching CS integrated with other "educations".

Keywords

Computer science · programming · elementary education

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Technological Pedagogical Content Knowledge as a Framework for Designing Technology-Enhanced Learning Environments for Computer Science: Effects on Student Learning

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Abstract

In this study, the authors directly respond to this call and adopt the framework of Technological Pedagogical Content Knowledge (TPCK) (Angeli & Valanides, 2009), in order to design technology-enhanced lessons for computer science topics, namely: (a) Data, Processing, and Information, (b) Central Processing Unit, and (c) Programming and Algorithmic Thinking. For the first computer science topic, the results showed that students' posttest performance on the concepts "data," "processing," and "information" in the experimental group outperformed students' performance in the control group, $F_{(1, 348)} = 378.04$, $p < 0.01$. For the lesson about the Central Processing Unit, the results also showed statistically significant differences in performances between the experimental and the control groups in favor of the experimental group, $F_{(1, 259)} = 427.76$, $p < 0.01$. Finally, similar results were obtained for the third lesson on the development of algorithmic thinking with significant differences between the experimental and the control groups in favor of the experimental group again, $F_{(1, 235)} = 62.52$, $p < 0.01$. In conclusion, the results of this study showed that TPCK was an effective framework for the teaching of Computer Science topics.

Keywords

Computer science · programming · secondary · education · computing

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Defining procedures in early computing education

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Abstract

From the early years of educational programming Papert and other researchers considered *procedural abstraction*, i.e. defining new procedures, the key instrument of computational thinking, an important approach in "the art of splitting difficulties*"* [1], and strived to understand its cognitive difficulty. At present, defining procedures is promoted in renewed computing curricula in several countries. For example, Computing at School (CAS) in the UK characterises procedure as a mechanism of abstraction, an instrument of generalisation, a pattern to be used to control complexity by sharing common features [2] and recommends that as well as *using procedures*, pupils should become proficient in *creating new abstractions* of their own. To meet this need, in many recent programming environments for novice programmers it is possible to define new procedures.

And yet, procedural abstraction is rarely acknowledged by more recent educational research. In this paper, we consider the fact that the delayed implementation of a mechanism for building procedures within Scratch, a widely used programming environment for children, may have negatively impacted the focus within curricular content and educational research on this powerful idea.

In our work, which is a part of a broader research project, ScratchMaths [3], aiming to explore connections between developing computational and mathematical thinking in the upper primary age pupils in England, we set out to explore which factors play a role in upper primary pupils understanding and utilizing the concept of defining procedures as a common and inherent instrument of their programming. We present our observations from the project design schools and demonstrate how they guided the development of our *pedagogic strategy for definitions*.

Keywords

programming · primary education · procedure · abstraction · ScratchMaths

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Broadening Participation of Elementary School Teachers and Students through Curriculum Integration and Statewide Collaboration: A U.S. Experience.

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Abstract

This paper explores challenges and lessons learned by EDC, the Massachusetts Department of Elementary and Secondary Education (DESE), and school systems around the state of Massachusetts as they design, develop, and test the integration of computational thinking into mathematics and science curricula in grades 1-6. The paper discusses (1) the US need for increased computer science education, (2) the structural and pedagogical processes being used to incorporate CT into academic disciplines and how these have been designed to facilitate scale-up, (3) the methods used to ensure high quality teaching/learning experiences for both computational thinking and academic disciplines, and (4) the nature and intensity of support needed by teachers to integrate CT. It closes with a set of recommendations for educational leaders and practitioners who are intent on working in their own communities to explore the integration of CT through disciplinary learning.

Keywords

computer science · disciplinary learning · computational thinking · curriculum integration · computing

Student Motivation and Content in CS Course: Less is More

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Abstract

In this contribution we will address the issue of student motivation of implementing new curricula for CS/informatics and how our solution was tested to help improve the students' motivation at the university level.

Our CS introduction to computers a common core for non CS students includes these main topics: computer hardware (system unit, secondary storage and input and output), software (system and applications), database and networking. Then we teach algorithms and programming skills using python. Based on the number of absences, students not following in class and not participating, and students expressing their boredom in the end of the semester survey; we saw that student motivation was an obvious and serious challenge.

The approach is to reduce the content and emphasize on what is taught and see if the students' motivation will improve. After having made the changes we compared the students' grades and collected professors' observations on the students' motivation. Based on those results we found that less is more, students were kept engaged for longer periods of time, and the grades have improved and therefore the students have more motivation for technology related topics and to further explore computer related content outside the classroom.

Keywords

Computer science · CS curricula · student motivation · education ·

Mining for Deep Learning in Minecraft™

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Abstract

Despite the corpus of research on game-based learning, representations of sand-box games such as Minecraft™, as tools for teaching and learning in research literature are limited. While many are enthusiastic about the potential of immersive virtual worlds such as Minecraft™ to facilitate interactive, engaging, collaborative and multimodal learning experiences (e.g. Lee, Dalgarno, Gregory & Tynan, 2016), there is limited available evidence to support such claims. Instead, the literature tends to report teachers' perceptions of using Minecraft™ in the classroom (e.g. Smeaton, 2014, Petrov, 2014) or documents subject specific applications (e.g. geometry, Förster, 2012) and digital storytelling (Garcia Martinez, 2014). The use of Minecraft™ as a tool to promote deep learning has received substantially less attention.

Drawing the principles of deep learning (Fullan&Langworthy, 2014) and game-based learning (Gee, 2008; Perrotta, Featherstone, Aston and Houghton, 2013), Leahy & Butler have devised a framework to explore and describe the learning opportunities that can emerge in the classroom context where Minecraft™ is used. This symposium presents the framework along with three cases from different projects in which Minecraft™ was used. Through these cases and utilising the framework, the symposium explores and reflects on the use of Minecraft™ as a tool for "deep learning".

Keywords

game-based learning · deep learning · Minecraft™ · classroom based ·

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Educational Support on Computing and Informatics as Means of Empowering Disadvantaged Young People in Developed Countries

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Abstract

The paper treats a research into civil empowerment and social inclusion in developed countries through expanding the learning opportunity of computing and informatics. The research questions is as follows: What kind of possibility and limitation can be found in the educational support on computing and informatics as a means of empowerment and social inclusion of the socially disadvantaged youths in the developed country? For the question, the author joined a group's activity that helps rehabilitation and social participation of such disadvantaged youths in a mid-sized provincial city of a developed country, applying action research as a participatory research methodology. The main findings are as follows: With some educational triggers, the supported youths got interested in creative aspects of computing and autonomously engaged in learning it; however, their expanded knowledge and skills didn't necessarily expand their motivation to improve their real social lives. The paper concludes that the educational support at present has a limitation as empowerment when computing and informatics are learned merely as a value-free decontextualized knowledge, which suggests the needs of further investigation, cooperating with the practitioners in the group, on the ways of motivating the disadvantaged youths to find their real needs of computing in their life.

Keywords

Computing and informatics · socially disadvantaged learners · educational support · social inclusion · empowerment

Collaborative postgraduate studies in higher education: A case study of South Africa

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Abstract

This research aimed to investigate the delivery of postgraduate course through incorporation of Google Applications and Skype technologies as collaborative tools. Participants were a cohort of full time working employees from a South African consortium of collaborating universities enrolled in the Post Graduate Diploma in Higher Education course, located in Limpopo and Western Cape provinces. The data was collected through interviews from participants on Skype and Google technologies that include Google drive, Gmail, Google docs, Google spreadsheet, and Google chat. Data was analysed through ethnographic content analysis and conversational analysis. Based on the findings, it was evident that Google applications and Skype technologies support collaborative learning. The study results show that these technologies have an important role in future delivery of academic post graduate programmes in institutions of Higher Learning amongst working employees. This study recommends use of these technologies in scenarios involving multiple institutions across the world. Cloud computing has a pivotal role in enabling online collaborative learning activities and it enhances effective skills development in cases where students cannot afford to attend courses on full time basis due to work commitments or geographical location.

Keywords

Google Apps · technology · collaborative applications · post graduate · higher education · Cloud computing

An educational experience with online teaching – not a best practice

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Problem- and Project-Based Learning (PBL) is a widely used pedagogical method in higher education. Although PBL encourages self-directed learning and works with the students' own projects and problems, it also includes teacher presentations, discussions and group reflections, both on-campus and online. Therefore, the teacher's plans might be relevant to the students' projects, but that is not always the case. This study investigates how master's students interact with an online Problem-Based Learning design and examines how technology influences these interactions. The empirical data stem from lessons at an online master's course, and they were collected and analyzed using a netnographic approach. The study finds that concepts like self-directed learning and active involvement of everyone can have very different meanings from the teachers' and the students' points of view. If the students do not see the relevance immediately, they often leave the online sessions. Hence the title: This study describes an experience and provides a point of departure for further discussion, but it is not an example of best practices for online PBL.

Keywords

Problem-Based Learning · Online Learning · Moodle · Video · Computer Science Education (CSE)

Book of Abstracts

Adolescents' internet attitudes: A study in an experimental Greek secondary school

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Abstract

This paper regards a validation study aiming to investigate secondary school pupils' internet attitudes. An 18-item questionnaire was administered to 260 adolescents (12-15 years old) of an experimental school, in Greece. Four factors were extracted: "affection", "perceived usefulness", "perceived control" and "behavior". The factorial structure of the questionnaire was revealed. The majority of the pupils expressed strong perceptions towards the usefulness of the internet. Over 90% of the adolescents believe that the internet can allow them to do more interesting and imaginative work and that it helps them acquire relevant information. Gender and age were not significantly correlated to the factors. The frequency of internet use had positive correlations with the factor "Behavior". "Perceived control" was statistically significant correlated with each of the factors "Affection" and "Perceived usefulness". The findings are discussed within the context of the safe introduction of digital tools ecosystems of this experimental school in Greece.

Keywords

Internet · attitudes · adolescents

Shaping future digital citizens in Aotearoa/New Zealand schools: Vision and challenges

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Abstract

The New Zealand Ministry of Education promotes the use of digital technologies in schools to support future-focused learning and to achieve the vision for New Zealand young people, as stated in the national curriculum document (Ministry of Education, 2007), to become 'confident, connected, actively involved, lifelong learners' This vision statement, extended in meaning since its inception in 2007 to encompass the concept of a 'digital citizen', has influenced the strategic direction for educational developments in New Zealand. It is also supported by a range of Ministry of Education initiatives. However, a number of challenges have arisen that impact the ability for New Zealand educators to fully realise this vision in schools. This paper presents an overview of the educational vision for students in the compulsory schooling sector in Aotearoa/ New Zealand and describes some current challenges faced by New Zealand educators as they aim to realize this within complex digitally enhanced environments.

Keywords

Digital citizen · vision · future-focused education · digital technologies · challenges

References (Omit if there are no references in abstract)

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SMART Robobraille: Producing accessible learning materials by means of Open Source Tools

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Abstract

The main objective of the project was to explore and describe how to prepare and create educational material in alternate formats in a smarter and easier way using RoboBraille[1] and other relevant free document conversion and authoring tools. Based on that, to develop a complete training course, ready to be implemented across Europe. The objectives were (i) too support the inclusion of the visual and reading impaired in mainstream education; (ii) to improve the quality of the education of the reading and visually impaired in mainstream environments; and (iii) to improve the way in which teachers, parents and alternate media producers use information technology to meet these objectives.

Through hands-on workshops, the project partners have educated a target group of mainstream teachers special-education teachers, university faculty and vocational trainers in using ICT[2] to improve the quality of the production of various educational material in alternate formats and as such provide a more inclusive educational environment with equal opportunities for students with special needs.

A further objective was to disseminate the results of the project to relevant parties by being able to offer the SMART Training Course developed as part of the project; and by presenting papers at relevant conferences, thus disseminating methods, practices, tools and didactics developed as part of the project at conferences attended by special-needs teachers, educators, parents, primary users and vision impairment professionals.

Keywords

Accessiblity · Open Source · Training Course · Inclusion · Assistive Technology

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Construction and Computing in Primary School: Photons, Electrons, LEGO, Logo, and Issues around the Core Curriculum

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Abstract

The British School of Sofia [1] some five years ago adopted a primary level curriculum devised by Iliieva and developed by Doyle [2]. Based on creative 'modelling your world' projects using LEGO systems for construction and Interface B and Control Lab Logo for computing, This approach to 'robotics' has greater core curriculum compatibility and is more modernisable than recent offerings like Scratch or WeDo, as participants will discover.

Papert's [3] belief that conscious constructions are more powerful than verbalizations points to a unique human adaptation for technology [4]. This is exercised in education in mastery of the symbol systems of literacy and numeracy; less formally expressed in children's drawings. There is no science without technology. The computer is a powerfully assistive educational replacement for the frozen flatland of the book [5].

Participants' will take the role of first to fifth graders, sampling projects, concepts and techniques, links to the core curriculum and its technological foundation; meeting Ellie electron and Freddy photon. Video illustrates projects constructed and coded: e.g. polarity-sensitive lights, traffic lights, windmills, lighthouse, and police-action. Coding progresses from button-pressing through commands to procedures with loops and parallel processing; and raises issues of mathematics, language, science, and fitness for purpose.

Keywords

(LEGO) construction · (Logo) computing · primary education · creativity · fitness for purpose

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Teacher's preparation for using ICT

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Abstract

ICT introduction at schools should be preceded by thorough planning and support for teachers. This article describes an example of a support project, organised for some Polish pre-service and in-service teachers.

The project was the result of cooperation of various institutions - especially by the In-service Teacher Training Centre (OEIiZK in Warsaw) and Pedagogical Faculty of Warsaw University.

To achieve the project's goals, a range of appropriate pedagogical approaches and methods were chosen. ICT use at schools is more about modern methods, which help to reach the full potential of new technology use in educations, than tools. Hence the project's course was based on constructionism approach supported by diverse pedagogical ideas (Eg. neuroscience findings, SAMR model, gamification, introducing to programming computers, connectivism, project based learning, assessment for better learning).

A fine lesson can be learnt from the project. The approach needs careful analyses of research about efficiency factors of teachers' preparation for ICT use, gathering information about teachers' needs, high motivation and hard work from participants and well prepared infrastructure at theirs schools.

Promising results were emerged by the project – teachers using ICT in new, wise and creative ways, ready to share their experience, to spread the ideas among others.

Keywords

primary education · integrating technology · teacher's preparation · ICT at school · support for teachers

Symposium: Approaches to teaching "Computer Science" in England and Ireland

The question of teaching "Computer Science" in primary and secondary schools is on the agenda in many countries but it is complex for several reasons. Firstly, there is no consensus as to what is best or most appropriate to teach with the spectrum of possibilities ranging from computational thinking to computer programming with the term computational thinking is itself ambiguous. Secondly where the emphasis is on teaching computer programming it needs to be realised that the topic is both difficult to learn and difficult to teach. There is extensive literature on teaching computer science and computer programming in particular and many innovative pedagogical approaches are advocated and an increasing amount of on-line instructional material freely available. In contrast in practice in 3rd level education traditional didactic lectures and practical programming lab work remains the dominant modalities. Finally, the fact that industry is struggling to find workers with computing skills – at a time when youth unemployment is a global challenge – and women and those from areas of socio-economic disadvantage remain significantly underrepresented in computing careers, suggests that there is an obvious need for new approaches.

In 2014-2015 England, Wales and Northern Ireland introduced Computer Science was as a subject to be covered by all ages from primary to A-level. In Ireland at present the only formal presence coding has on the curriculum is in the form of a syllabus for a 200 hour course in coding which is optional for years 1-3 in secondary schools. However a great deal of coding activity goes on outside the formal classroom in computing clubs of which CoderDojo is currently the most prominent.

This symposium will focus on the approaches to teaching "Computer Science" and Science, Technology, Engineering and Mathematics (STEM) being followed in two universities in England and Ireland.

Participants:

Dr. Lynne Blair – Lancaster University
Sophie Beck – Lancaster University
Dr. Jake Rowan Byrne – Trinity College Dublin
Grace Lawlor – Trinity College Dublin
Kevin Sullivan – Trinity College Dublin

Value Sensitive Education Design: reflecting on inclusivity and diversity in STEM subjects

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Abstract

This paper proposes the need for reflection on the values we bring to teaching practices and education design, in order to support inclusivity and diversity in computer science and STEM education in general. The political system readily acknowledges that all children have the right to equal opportunities, yet despite over 30 years of conscious efforts to attract a diverse range of students into STEM education and STEM careers, concerns for inclusivity and diversity are yet to be fully addressed.

This paper proposes that Schwartz's theory of basic human values can provide a tool for 'value sensitive education design' – a means to make STEM and computer science education more inclusive and representative of the diversity of values amongst underrepresented groups, and fostering learning environments that are sensitive to all value types. The theory of basic human values offers high level value types that can be adopted as a tool to support reflection on values, from where we can begin to design, communicate and educate value narratives that are meaningful to all learners, moving towards a more inclusive and diverse educational experience for all.

Keywords

Computer science · STEM · post-primary · education · diversity

Coding with Bridge21 and the Girls Codeplus Programme

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Abstract

Women are underrepresented in the field of Computer Science. This project aims to help Secondary School girls develop an insight into the role computers play in society and to learn some of the key skills in computing including computer programming. Exposure to Computer Science, in home or school environments, and encouragement from family and peers are leading factors that influence girls' decisions to pursue careers in Computer Science. Other factors include the girls' perception of their own problem solving ability, an understanding of the diverse applications of Computer Science and related career paths and the potential for positive social impact. This paper describes the design of an after school computing programme, CodePlus, which uses a novel 21st Century learning model. Pre and post questionnaire are being used to explore girls intentions to study CS, their confidence to study CS, perception of CS as a career, gender perception of CS and IT profession and self-efficacy following participation in the CodePlus programme. Preliminary results comparing pre questionnaire results with a male control group highlight differences in how girls see themselves in terms of CS capabilities and their future potential. Initial post questionnaire findings show a significant increase in the participants' perceived programming ability.

Keywords

Computer Science Education· coding · gender · education · computing

Promoting Careers in Computer Science Through IoT and Wearable Hackathons

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Abstract

This paper explores the use of a constructivist 21st century learning model to implement a week-long workshop, delivered as a "hackathon", to encourage pre-university teenagers to pursue careers in STEM with a particular emphasis on computer science. For Irish pre-university students, experience of computing can vary from word processing to foundational programming, and while many schools are introducing more ICT into the classroom, many students are left with a narrow view of what computer science is about. Twenty-one students participated in the workshop and completed pre- and post-surveys, and a free word association exercise in the areas of computing and careers in computing. Analysis revealed that students' motivation to learn about the Design process, Programming, Inputs and Outputs, and Wearables/Internet of Things increased following participation. There were also increases in confidence in Inputs and Outputs and Wearables/IoT following participation, as well as changes in the computing word associations, with students associating computing more with computer programming terms rather than general terms such as the internet. The findings suggest that the combination of a hackathon event and a model for 21st century learning is effective in motivating and increasing the self-efficacy of pre-university teenagers in a number of emerging technological contexts.

Keywords

Computer science education · STEM · Hackathons · Teamwork · Internet of Things

Information Systems Curriculum in an Australian University: Past Developments and Future Directions

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Abstract

In this paper we describe the development of Information Systems (IS) curricula in the Business Faculty of an Australian university over the last 40 years, but then look at how what has happened is likely to affect future developments. The paper looks at how curriculum content was added over the years when it covered what was considered, at the time, to be important new material. In many cases in later years this material became mainstream and so there was no need to include it in IS courses. An example of this is eCommerce which was an extremely important new area in the late 1990s that was developed into new IS subjects and new undergraduate and postgraduate degree courses. By the mid-2000s, however, everyone was using eCommerce and it was included in many other subject areas, making it no longer necessary to be included in IS courses and it disappeared. Finally we question what might happen to IS courses into the future.

Keywords

Information Systems · Business Computing · Higher Education · Australian Universities · History

The Value of Project Management Education for IT Professionals

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Abstract

IT organisations and organisations with IT Departments frequently procure project management training as part of their initiatives to improve business outcomes through professional education. This paper utilises the results of a research study that focused on the training of the project management methodology PRINCE2 in an organisation where IT was one of the departments. The longitudinal study over two and a half years reported on the adoption of the PRINCE2 project management methodology by sixteen employees following the successful completion of a PRINCE2 training course. Two different outcomes were observed: Individuals continued to develop their interest in PRINCE2 and looked for a stable network that will support their practice, even if they resigned from the organisation. The other outcome was that individuals ceased using PRINCE2 for their projects if there was no imperative given by the organisation to use it and no example set by others in using it. The adoption outcomes from this study have implications as to the interventions that need to be implemented by organisations to derive the value from an investment in professional vocational education in project management for all relevant professionals

Keywords

Project Management Training · IT Professionals · PRINCE2 · Professional Vocational Education · actor-network theory

Development of a Model to Assess the Digitally Mature Schools in Croatia

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Abstract

This paper shows key steps in the development of a Model for Digitally Mature Schools in Croatia and reveals the results of assessment of digital maturity of schools in Croatia. In total, 151 primary and secondary schools were assessed against maturity levels using the instrument, and two different methods for gathering the data: self-evaluation and external evaluation. Notable differences were recorded between results of self-evaluation and external evaluation in favour of self-evaluation. Some of the factors that contributed to the differences are lack of experience in conducting self-evaluation and additional training for external evaluators in opposition to written guidelines for conducting self-evaluation. The next step is to refine and upgrade the instrument based on comments and suggestions gathered during external evaluation and self-evaluation. Towards the end of the pilot project the final self-evaluation and external evaluation is planned to monitor progress in the schools. In order to lower the differences between results of self-evaluation and external evaluation, besides upgraded instrument, school staff will be more intensively prepared for conducting self-evaluation.

Keywords

Digital maturity · maturity framework · e-schools · self evaluation · external evaluation

Feature Based Sentiment Analysis for Evaluating the Mobile Pedagogical Affordances of Educational Apps

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Abstract

The launch of millions of apps has made it challenging for teachers to select the most suitable educational app to support students' learning. Several evaluation frameworks have been proposed in the research literature to assist teachers in selecting the right apps for their needs. This paper presents preliminary results of an innovative technique for evaluating educational mobile apps by analysing the feedback of past app users through the lens of a mobile pedagogical perspective. We have utilized a sentiment analysis tool to assess the opinions of the app users through the lens of the criteria offered by a rigorous mobile learning pedagogical framework highlighting the learners' experience of *Personalization*, *Authenticity* and *Collaboration* (iPAC). The investigation has provided initial confirmation of the powerful utility of the feature based sentiment analysis technique for evaluating the mobile pedagogical affordances of learning apps.

Keywords

Mobile Learning · Sentiment Analysis · m-Learning Pedagogies

The use of tablets in secondary schools and its relationship with computer literacy

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Abstract

The use of new technologies has become increasingly important in the light of the rapid technological progress made in what is commonly referred to as the digital age. Schools are now facing the challenge of imparting digital competencies to their students in order to ensure their participation in the society. In this context, mobile technologies do not seem to be used on a regular basis in schools. The present paper aims to identify the relationship between the frequency of tablet computer use and students' computer and information literacy (CIL), which currently constitutes a research gap. The data is gathered in a quasi-experimental design from an individual school in Germany. Drawing on data from tablet classes and control groups taught without tablet computers, the frequency of use and the students' level of CIL are examined. While results suggest that (1) students in tablet classes use tablets significantly more often, (2) the control group's level of CIL is higher than that of tablet class students, and (3) the theoretically established correlation between the use of tablet computers and CIL cannot be maintained, teachers indicate in interviews that there are indeed positive effects that go along with the use of tablet computers (4).

Keywords

Tablets · computer literacy · CIL · new technologies · school

Main paper title: Determinants of Mobile Learning in Indigenous/Cultural Contexts: The Phenomenon in Canadian First Nations

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Abstract

This paper is based on a study that examined how Indigenous adult post-secondary learners adapt and orient themselves between Eurocentric and Indigenous cultural ways of learning. The study derives contextual impetus from Canadian provincial and national policy and strategy documents that support learning in remote Indigenous communities geographically removed from mainstream society. The reach of urban education remains minimal and strategies to improve inclusion are challenged for adult post-secondary learners in these communities. The study takes place in a remote Aboriginal community in North Canada; accessible only by plane and winter ice roads. Schools in this community register historical high attrition, low completion and participation rates. One significant challenge concerns the disconnect between Eurocentric and Indigenous learning methods within which community members have been traditionally known to constantly straddle. This phenomenological study utilizes purposeful sampling to identify information rich participants, narrative inquiry as research method to elicit the determinants of technology-based culture-centric indigenous learning, and mobile technologies as a tool to produce documentation for how students negotiate and adapt between these worldviews. The study's outcome is an important Techno-Culture Adaptive Framework (TAF) that researchers, policy makers, educators and administrators can use for more effective technology programming in indigenous communities.

Keywords

Indigenous · culture · educational technologies · Aboriginal · mobile learning

Online Teacher Education: Transforming Teachers' Knowledge for Teaching with Digital Technologies

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Abstract

This case study focuses teacher education toward the design of online learning educational environments to guide in-service teachers' development of technological pedagogical content knowledge (TPACK), the knowledge for effectively integrating technologies in their classroom instruction. This study describes a researcher-designed learning trajectory instructional approach that highlights key online instructional features that guide teachers in improving and refining their TPACK. In an online Masters' degree program, the research-based learning trajectory transforms teachers' knowledge for teaching mathematics with technologies by focusing on the development of their knowledge-of-practice through "systematic inquiry about teaching" with technology that considers "learners and learning, subject matter and curriculum, and schools and schooling" (Cochran Smith & Lytle, 1999, p. 274). The multiple case, descriptive study provides a rich description of how the features of the learning trajectory influence nine K-12 teacher participants' thinking about their own thinking with the technology for learning mathematics and their thinking about their students' thinking and understanding when learning with multiple technologies. The study concludes by proposing that teacher educators consider incorporating such a researcher-designed learning trajectory instructional approach to interweave descriptive tasks with specific pedagogical strategies in order to enhance teachers' knowledge for teaching their content with technology – their TPACK.

Keywords

Communities-of-Learners · in-service teachers · learning trajectory · knowledge-of-practice · online

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Blended Learning: the shift to new ways of teaching and learning

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Abstract

Blended Learning is both a simple and complex pedagogical approach. It is increasingly regarded as an important vehicle for education reform. A plethora of definitions exist which range from broad to narrow, and specific. If approached as a fundamental restructure, rather than just another education overlay, then Blended Learning can be become a strategy to transform the nature of both teaching and learning. Learners are engaged in ways not previously seen or experienced.

This paper has emerged from an interest in, and experience with, the use of technology to support learning and teaching practices. The specific areas of focus to be addressed will centre on summarising aspects of the literature related to blended learning; explore models and frameworks for blended learning, and how these have been embraced by UTS:INSEARCH; consider possible challenges, benefits and implications for using blended learning; and, identify possibilities for further research from gaps within the literature.

UTS:INSEARCH is a pathways provider preparing students from diverse language and learning backgrounds for study in Australia. Examples provided will relate to the academic subjects delivered as part of the Diploma programs which are focused on strategies that ensure a student-centred technology-enabled learning experience is provided across all subjects.

Keywords

Blended Learning · models · teaching and learning · pathway education · case study

Online Laboratory Management: Analysis of the Contribution of Experiential Learning on the Web

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Abstract

The study aimed to analyze the contributions of the Online Laboratory Management (OLM) in the participants' learning from the analysis of an experience in a quasi- experiment. This proposal attended students of undergraduate courses in management of a Public University in the State of Rio de Janeiro - Brazil, using as a learning strategy the Laboratory Management, a conceptual tripod composed of an organizational simulator, a business game and applied research (Sauaia,2008). Interviews with 29 students were performed, whose script was based on two categories of analysis. The data were analyzed through this technique (Bardin, 2011). The results indicate that experiential learning may occur in a virtual context, and it is possible for the student to obtain a meaningful learning experience peruse the Kolb Cycle (1984) in an educational environment mediated by technology. In addition, the study presented a business game planned for use from a distance that encourages active participation of students. It also presented the use of a simulator that would need interaction among teams. The study describes the need to revise the conventional model of presential (on-site) and semi-presential managerial education and the possibility of using active methods in an online environment.

Keywords

Experiential Learning · Managerial Education · Online Laboratory Management · Business Game.

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Book of Abstracts

ICT4D, Education and Sustainable Development Symposium

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Abstract

This is a symposium aimed in sharing and initiating academic work on information and communication technologies for development (ICT4D), education and sustainable development. We plan to share experiences and start further collaborative initiatives for research, development & innovation funding, for example, Horizon2020 applications. Thus, there are academic research papers that are presented in the symposium. Topics to be presented include collaborative postgraduate studies in higher education: a case study of South Africa, enhancing learning in a virtual environment and learners' experience in a multicultural online collaborative learning environment: a case of ICT4D course. In addition, we seek to explore potential collaborative avenues and initiate joint project proposals.

Keywords

ICT4D · sustainable development · collaborative research · education · joint project proposal initiation

Learning in Fab Labs and Makerspaces: Towards a Framework for Including Novice and Expert Fab Lab Users in Digital Fabrication Practices

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Abstract

Fab labs (or fabrication laboratories) are open workshop spaces that provide digital manufacturing tools, electronic stations and technical knowledge to the public. Over the last fifteen years, an increasing number of educators have become aware of the implications of digital fabrication and physical computing in education but there is a little research on how people acquire knowledge in informal learning spaces like fab labs, makerspaces and hackerspaces. In this paper, we first summarize the research on learning in fab labs and then discuss different learning approaches on how fab labs and makerspaces can support learning activities of people with diverse abilities and experience. We suggest that learning in fab labs and similar informal learning environments, also occurs without making and can be linked with the potential to increase interest in STEAM (Science, Technology, Engineering, Art, Mathematics), develop technical skills and provide an assistive technology environment for learning. However, it is crucial to consider when and under which circumstances learning without making could be fruitful and not interfering with learning in a constructive way.

Keywords

Informal learning environments · technological equity · making · digital fabrication · assistive technology for learning

What Teachers and Students Know about Data Management

Andreas Grillenberger & Ralf Romeike

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Abstract

Data management is a highly innovative field of CS, which evolved from the original field databases in the last years. With the ongoing developments, several topics from this field are pervading our daily lives, such as cloud computing, large data collections or data analyses in various contexts. Although more and more students and teachers get in contact with data management topics and need to develop competencies in this field, current CS education typically does not sufficiently address them. Yet, students and teachers both have experiences with certain aspects of data management and may have built up knowledge on them, which needs to be considered in CS teaching. Hence, we investigated the attitudes and prior knowledge of teachers on several data management topics and explored the students' knowledge in this field.

Keywords

data management · teachers · students · knowledge · attitudes

Facebook use in Malaysian higher education classroom: An opportunity or challenge?

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Abstract

The usage of social media, especially Facebook, by university lecturers and students has been an interesting research area for educationists and social scientists. Drawing on the role played by Facebook in high education, this paper aims to explore the consideration of Facebook as innovative practices for effective classroom teaching and learning in Malaysian higher education. The two research questions for this paper are: RQ1: How Facebook is utilized in Malaysian higher education classroom? and RQ2: How Facebook is perceived as effective teaching and learning tool in classroom education? A qualitative research method was adopted. Semi-structured interviews were conducted with three participants from two private universities in Malaysia. The participation of the respondents was voluntary. Through an examination of the use of Facebook by Malaysian lecturers and student, and their interpretation of Facebook – an opportunity or challenge – for effective teaching and learning practices in classroom education; this paper illustrates the role of a social technology such as Facebook in a formal learning environment. The findings are valuable to academics who are interested in using social media technologies for teaching and learning and for researchers who are interested in innovative learning technologies.

Keywords

Facebook · teaching and learning tool · higher education classroom · Malaysian higher education

Experiential Learning: Beyond the Classroom and Connecting with the Industry

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Abstract

To address dynamic needs of the industry, student learning must extend beyond the classroom [1-3]. Considering the packed nature of traditional curriculum, incorporating new courses is challenging. A model is presented where the desired learning is acquired by engaging both undergraduate and graduate students in research partnerships, and without unduly extending the duration of their degree program. The success of this model has been demonstrated over many years by deployment of a variety of solutions for a diverse group of stakeholders, and an ever-growing demand for expansion. A few selected projects are presented to illustrate the skills acquired by students; these include training in state-of-the-art technologies, creative thinking, research publications, and prospects for immediate hiring upon graduation. The collaborative projects not only provided pedagogical and financial benefits to the students, but also opened avenues to increase business value within partner organizations. Finally, the paper presents challenges encountered which include space, turnovers, transitioning, data access and perception of shadow IT. The ideas presented are applicable to emerging areas as well as those where broader adoption is underway. Many of these areas are interdisciplinary in nature such as Business Intelligence, advanced analytics, cloud computing, Internet of Things, and Business Process Management.

Keywords

Experiential learning · analytics · business intelligence · emerging areas · ICT

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Social Demands in Ubiquitous Computing: Contexts for Tomorrow's Learning

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Abstract

We live in times of digital change, which is characterized by increasing pervasiveness of embedded and cyber-physical systems in our society. We are predominantly surrounded by mobile devices and reactive systems that capture context variables with the aid of sensors and affect the physical world with actuators. Dealing with embedded systems requires new knowledge and competencies that cannot be acquired in traditional teaching. To allow future generations to participate in social discourse, to understand media coverage and to make informed decisions, it is essential to address the relevant aspects in the classroom.

This article examines requirements our digital society places on CS education, in order to identify contexts and phenomena that can be used as anchor points for teaching in this subject area. The analysis resulted in about 200 concrete contexts, activities and knowledge areas from 16 superordinate categories. In combination with content knowledge relevant in this subject area, specific learning scenarios can be generated that raise students' awareness of risks and opportunities of modern technologies and built competencies so that they are able to customize and control their environment and to deal with new technologies with expertise and without fear.

Keywords

Computer science · education · embedded systems · ubiquitous computing · social demands

Gender Difference in Handmade Robotics for Children

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Abstract

There are several kits for sale in the educational market that aim to encourage children to interact with technology and programming through the use of enjoyable activities which incorporate tangible robots. However, less expensive "craft" alternatives are also available, including handmade robotics. This paper describes the development of *Rospino*, a robotics kit aimed at children aged from 9 to 11, by a collaboration between the Department of Linguistics and Comparative Cultural Studies and the Technical Institute Max Planck. The project is still being tested and is going through several design iterations based on feedback collected from teachers and children during the last year. The study presented in this paper is part of research still under development which aims to verify whether there are gender differences in self-efficacy and perceived involvement in handmade robotics activities. Although some materials are not inherently attractive (e.g., rubber bands, bottle caps, pieces of wood, wires, etc.) and could be labelled as "male stuff", the results show an equal perceived involvement and an increase in self-efficacy among 133 primary school students.

Keywords

Handmade robotics · Gender difference · Computational thinking · Self-efficacy · Perceived engagement

Real Time Experiential Learning: a quasi-experimental study

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Abstract

This study aimed to evaluate the academic performance of students from a blended learning (BL) course mediated by digital resources. The appraised course is offered to management courses of a public university in the State of Rio de Janeiro, Brazil that adopts the Management Laboratory in their curriculum. The Management Laboratory integrates management education, business games and applied research as learning strategies (Sauaia, 2008). A quasi-experimental study was established to compare the academic performance of BL students (Online Management Laboratory) with students from eight face-to-face model lectures. In total, we evaluated the response of 327 students through Mann-Whitney and Kruskal-Wallis non-parametric tests to identify disparities and similarities in their respective evaluation process performance. The results obtained from previous classes suggested that the students' performance was statistically similar, indicating that the participants of the BL classes showed no performance prejudice. However, in comparison with lectures from the same semester, we identified some differences. This study provides to teachers the possibility of improvement of the students' formation process in combining the experiential learning with online education.

Keywords

Experiential Learning · Management Education · Blended Learning· Business Game · Laboratory.

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Community of Practice : Growth, Change, Transformation and Death: A Literature Review

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Abstract

Community of practice (CoP) has been an influential concept. Much has been written about what it is, and how it is operationalised. Less attention has been paid to how CoPs grow, change, transform and die. This short literature review aims to explore how these aspects of CoP have been addressed by scholars. The main finding is that there is little academic work on CoP change. This does not necessarily indicate a gap in the literature. Instead, it is probably a consequence of how CoP was theoretically framed in relation to other knowledge domains.

Keywords

CoP · communities · practice

Development of web-based learning scenarios – a connection of didactical aspects, web-based learning and ontological structures

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Abstract

In the explanation is investigated how teachers can be supported and guided in the planning of web-based learning scenarios. Using a graphical user-interface (GUI) the teachers are enabled to choose existing learning-concepts and realize them by web-based learning.

The presentation will follow the path from gaining a term set to the prototype of a graphical user interface. Based on classical models of didactics a class-hierarchy of identifiers for learning-phases, learning-methods and learning-tools was developed.

After empirical studies this term set has been implemented in an ontology, whose structure will be examined in more detail. Using editors for creating the sets of meta-data and the ontology first prototypical solutions are presented. Based on this ontology the graphical user interface was designed, which enables the saving, loading and sharing of learning scenarios based on web-standards. One outlook on further research options is the mapping of the ontological structure into a learning platform.

Keywords

Web-based learning · didactical models · ontology · learning platform

Book of Abstracts

WCCE 2017 Symposium

Rethinking learning in a digital age: Connecting research, practice, and policy making

Introduction

EDUsummIT (Education Summit on ICT in Education) is a global knowledge creating community of researchers, policy-makers, and partitioners who are committed to support the effective integration of ICT in education. Working together with several international organisations including UNESCO and IFIP, EDUsummIT has been held four times in the past, in the Hague (2009), Paris (2011), Washington D.C. (2013), and Bangkok (2015). About 100 people participated in each EDUsummIT, and thematic groups are set up prior to the Summit to work online to undertake research on pertinent topics in the field of ICT in education and prepare discussion papers. These papers are further developed during the EDUsummIT. After each EDUsummIT, TWG findings are published in journals and presented at national and international conferences. The next EDUsummIT will be held in Borovets, Bulgaria, on September 18-20, 2017, with the theme of *Rethinking of Learning in a Digital Age*. Nine thematic working groups (TWG) have been set up and the research process has commenced. The nine thematic groups are:

TWG1: Education systems in the digital age: The need for alignment
TWG2: Informal learning with technology
TWG3: Professional development for technology-enhanced Learning leaders
TWG4: Digital agency to empower equity in the education
TWG5: Formative assessment supported by technology
TWG6: Developing creativity in teachers and learners
TWG7: Learning from national policy experiences
TWG8: Upbringing in a digital world: Opportunities and possibilities of schooling
TWG9: Sustainability and scalability in research approaches

In our symposium there will be five presentations. The first presentation will outline the evolution of the EDUsummIT as a knowledge building community and provide a summary of the major findings and recommendations of the nine thematic working groups of EDUsummIT 2015. Leaders of four thematic working groups of EDUsummIT 2017 are able to attend WCCE and will present a progress report on the findings of research undertaken by their groups.

Presenters

Deirdre Butler, Dublin City University, Ireland
Kwok-Wing Lai, University of Otago, New Zealand
Margaret Leahy, Dublin City University, Ireland
Cathy Lewin, Manchester Metropolitan University, U.K.
Don Passey, Lancaster University, U.K.
Miri Shonfeld, Kibbutzim College of Education, Israel
Peter Twining, The Open University, U.K.
Mary Webb, King's College, U.K.

Chair: Kwok-Wing Lai, University of Otago, New Zealand
Discussant: Margaret Cox, King's College, U.K.

EDUsummIT: Connecting researchers, practitioners, and policy makers in a knowledge building community

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Abstract

International collaboration among researchers, practitioners, and policy makers are rare. While they meet in international conferences, few sustained communities are developed from these conferences as conferences are designed primarily to disseminate knowledge rather than create knowledge. The Education Summit on ICT in Education (EDUsummIT) is a unique model in knowledge creation. First formed in 2009, the EDUsummIT has been held four times. EDUsummIT participants meet biennially, and thematic working groups (TWG) focusing on pertinent research topics in ICT in education are formed prior to a Summit to conduct research and prepare discussion papers online. These papers are further developed during the Summit. At the EDUsummIT 2015, co-hosted by UNESCO Bangkok, nine thematic groups with approximately 100 people from over 35 countries spent several months prior to the Summit working on their topics of research online, before attending a 2-day meeting in Bangkok, discussing, revising and extending their research and policy papers [1, 2]. In this presentation we will discuss the evolution of the EDUsummIT as a knowledge building community and provide a summary of the major findings and recommendations of the nine thematic working groups of EDUsummIT 2015.

Keywords

ICT in education · international collaboration · knowledge building

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Education systems in the digital age: The need for alignment

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Abstract

The importance of having alignment between education visions, policy and practice is well established [1, 2]. However, what is less clear is what the purposes of education systems should be in a rapidly changing world, and thus what educational visions, policies and practices might be most appropriate. We need to confront the fact that longstanding assumptions about what education is for, who conducts it, and how it is assessed, need to be challenged [3]. This paper explores alternative views about what the future holds, recognizing the potential impact of digital technologies in both 'developed' and 'developing' countries. This will inform discussion of what appropriate purposes for education and hence educational visions might look like. A range of models will be considered and key dimensions of practice, including the role of digital technologies, will be highlighted. This will inform discussion of appropriate policies and practices related to curriculum, pedagogy and assessment, aligned with educational visions. 'Connectedness' on many levels within and across schools and society will be essential [4] as it is widely recognised that policy-making has most impact when it is co-ordinated across the various stakeholders [5].

Keywords

Vision · policy · practice · education system · purpose

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Bridging formal and informal learning with technologies

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Abstract

The ubiquity of digital and mobile technolgoies offers new learning opportunities across time and space, and as such it is essential for educators and policy makers to develop a better understanding of the interrelationship between young people's digital practices within and outside school. The TWG2's investigation has focused on how children and young people understand the relationship between informal and formal learning, and how informal learning could be supported by technology, in particular, we review best practices for bridging the formal with the informal (and non-formal) [1, 2, 3]. Our group addresses the following research questions:

- What are the key pedagogical, research, and policy issues related to the bridging of formal and informal learning?
- How can we ensure that harnessing technology-enhanced informal learning in school contexts was inclusive?
- How can we address moral and ethical issues related to blending formal and informal learning?
- What are the implications of bridging formal and informal learning for assessment practices?
- What support structures needed to be in place to scale-up the integration of technology-enhanced informal learning in school contexts?
- In what ways can different stakeholders be mobilized to support informal learning with technology?

In our presentation initial findings from our group will be reported.

Keywords

Bridging formal and informal learning · ICT in education · technology-enhanced informal learning

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Digital agency to empower equity in education

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Abstract

TWG 4 is researching digital agency empowering equity in education. We consider definitions of digital agency, identify projects and practices positively supporting equity, and explore impact in this field. Martin defined learner agency as "the capability of individual human beings to make choices and act on these choices in a way that makes a difference in their lives" (p.135) [1], while Lindgren and McDaniel concluded that "narrative and agency have complementary influences on processes of learning and engagement, … nurturing human thinking and creative expression" (p.353) [2]. Schwartz and Okita (n.d.) differentiated factors supporting high, rather than low, agency, including how cultural background may affect how individuals engage with student-centredness [3]. We focus on this latter concern, identifying relevant worldwide projects, such as the Technology, Education, and Cultural Diversity (TEC) Center in Israel, the Global Classroom in Canada, and the Dissolving Boundaries Project in Ireland. Our aim is to identify and recommend appropriate practices to those supporting 4-21-year-old learners onsite, online or in blended approaches. As digital engagement with learning is increasing, concepts of digital agency must be considered appropriately by policy makers and practitioners when developing and implementing provision for learners, locally, regionally, nationally and internationally.

Keywords

Digital agency · equity · ICT in education

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Formative assessment supported by technology

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Abstract

The future of assessment faces major challenges including, perhaps most importantly, the extent to which assessments, when enabled by IT, can serve simultaneously the needs of learners and those of the enterprise of education [1, 2]. In many countries, in recent years, a renewed focus on assessments to support learning has been pushing against the burgeoning of testing for accountability [3, 4], which in some countries, renders effective formative assessment practices almost impossible [4]. Furthermore a strong focus on summative assessment for accountability can reduce motivation and disengage many learners [5]. At the same time use of IT-enabled assessments has been increasing rapidly [3], as they offer promise of cheaper ways of delivering and marking assessments as well as access to vast amounts of assessment data from which a wide range of judgements might be made about students, teachers, schools and education systems. Opportunities for using IT for formative assessment are underexplored and less well understood than those for summative assessments. At the same time formative assessment is known to be extremely important for learning. Our aim is to identify examples of innovative practices as well as research evidence of how IT -enabled assessment can support formative assessment practices and assessment as learning.

Keywords

Assessment · formative assessment · testing · accountability · IT-enabled assessment

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Apps for All: Using tablet technology with child-centered apps to raise learning standards worldwide

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Abstract

This cross-disciplinary symposium brings together papers from early career researchers and established academics working with an international NGO on the Unlocking Talent Project. The Unlocking Talent Project combines hand-held tablet technology with child-centered apps to raise standards in basic maths and reading in primary school children around the world. The project has received considerable investment from an international consortium of funders. We started evaluating the Unlocking Talent Project in 2013 through a series of scientific research studies conducted in Malawi and the UK. We are now expanding the project to Brazil, South Africa, Uganda, Tanzania, Ethiopia, Kenya, and Sierra Leone. This project directly addresses the global education crisis of learning underachievement facing low, middle, and high-income counties articulated by the United Nation's Sustainable Development Goal 4. In this symposium we consider the utility of tablet technology and child-centered apps to deliver high quality education for all. We present evidence across a range of studies with children in mainstream education, low-achievers, children who have failed to progress with traditional teaching methods, and children with Special Educational Needs. Our analyses also consider the impact of gender, social deprivation, and the child's first language on learning gains.

Keywords

Tablet technology · Child-centred apps · Improving early education

Apps for All: Using tablet technology to raise early years' attainment levels across countries and cultures

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Abstract

Tablet technology is increasingly being viewed as a method for delivering quality learning materials in classrooms. Globally, initial studies have been promising, but the evidence base is still emerging[1]. A 'oneclass' solution is currently being implemented across Malawi through the Unlocking Talent project. 'oneclass' consists of a learning centre and maths and reading apps. The apps are delivered individually to children, in their local language, through headphones connected to iPad minis and with the aid of a virtual teacher built into the software. The project is currently rolling out the maths apps to over 100 primary schools, which is being evaluated through a school level RCT. A proof of concept pupil level RCT began in January 2017 for the reading app. A cross-cultural study is also being conducted in several different countries: Malawi, UK, Brazil and South Africa. This will help inform whether the maths apps can raise attainment levels across different countries and cultures for children in their first year of school. It is also examining if specific cognitive predictors of learning via tablets and apps are universal or culturally specific. Results will show if this technological solution can produce significant learning gains for all.

Keywords

Tablet technology · Child-centred apps · Improving early education

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Apps for All: Using tablet technology to support learning of Special Educational Needs children in Malawi

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Abstract

Education for all promotes an inclusive policy that serves the needs of mainstream learners as well as learners with Special Educational Needs and Disability (SEND). It is thus crucial to investigate the appropriateness of any new intervention that is introduced within an education system for all learners, including those with SEND. We have been evaluating the implementation of a new tablet technology intervention that is being introduced within Malawi primary schools. It uses mobile tablets to deliver high quality child-centered apps designed to support the acquisition of basic maths and reading skills for learners in the first two years of primary school. We observed a group of 33 learners identified as having SEND interacting with the tablet technology intervention. For each learner we determined rate of progress within the apps and extent of disability. We showed that all learners could interact with the apps but children with less severe difficulties made better progress than those with more profound difficulties. Learners with SEND progressed through the apps at half the rate of mainstream children. As child-centered apps provide the same instructional input to all learners they offer an innovative and inclusive solution for delivery of high quality education for all.

Keywords

Tablet technology · Child-centred apps · Improving early education

Apps for All: The impact of using tablet technology on teaching practice in Malawi primary schools

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Abstract

In addition to the challenge of increasing the supply and quality of trained teachers throughout primary schools in Malawi, the recent introduction of tablet technology in primary classrooms brings further training requirements for teachers and education officials, as they are required to use technology that they are not familiar with. With the Unlocking Talent Project, Voluntary Services Overseas is introducing a tablet technology intervention in Malawi to improve standards in maths and reading through delivery of high quality instruction via child-centered apps. The intervention is currently being implemented in over 100 primary schools across Malawi and requires teachers to assist learners with using the technology as they work through the various topics covered in the apps. The innovative features of the technology require initial and continued training of teachers if learning benefits with the technology are to be maximized. We are exploring teachers' training requirements and attitudes to the technology by conducting interviews with class teachers, head teachers, chairs of parent committees, and education officials. Analysis of video footage of lessons using the technology and lessons involving standard classroom practice is also informing us of the impact of this technology intervention on teaching practice and classroom management.

Keywords

Tablet technology · Child-centred apps · Improving early education

Apps for All: Using tablet technology as a pedagogical tool in Brazilian primary education

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Abstract

Over the last 40 years, public policy in Brazil has set out to embed technology in schools across the country to improve teaching and learning standards. Despite investments in equipment, distribution, and training to use technology in the classroom, few positive results have been identified. Challenges to the successful implementation of technology within education in Brazil largely relate to the 'one size fits all' approach that is used in teacher training. This is problematic, as it does not take into account differences in classroom practice amongst individual teachers. Education technology interventions, such as that adopted by the Unlocking Talent Project, that use child-centered apps to deliver a solid curriculum, may provide a potential solution to raising learning standards in Brazilian primary schools, as they are easy for schools to implement and provide consistent pedagogical input from within the app.

We will consider the potential for deploying the Unlocking Talent Project within Brazil, and the challenges that may ensue in terms of infrastructure, teaching capability, technological support, and training requirements. We will also demonstrate Brazil's readiness to adopt this type of education technology and will highlight any changes to policy and/or practice that might be required to facilitate successful implementation.

Keywords

Tablet technology · Child-centred apps · Improving early education

Apps for All: Using tablet technology to raise maths attainment in disadvantaged children in the UK

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Abstract

Underachievement in maths is a global issue. Tablet technology with child-centered apps can offer an innovative classroom based solution. However, rigorous scientific evidence is needed to establish the effectiveness of the technology in supporting early maths development. We report on four small-scale 'proof of concept' studies and a pupil-level Randomized Control Trial (RCT) with 389 children that explored proof of concept for using maths apps to support basic maths instruction in the first three years of UK primary school. Results showed children aged 4-7 years made on average a 24% increase in curriculum knowledge after using the maths apps for 30 minutes a day for 6-13 weeks. The child's first language and their socio-economic background did not affect their learning gains. Furthermore, children with weaker memory skills showed the strongest learning gains, which may be attributed to the repetitive and interactive features included in the apps aiding these learners. Finally, the apps were shown to be significantly more effective than standard classroom practice, especially for low-achieving pupils. Together these results indicate that the combination of child-centered apps and interactive tablet technology can be an effective means of delivering quality education to children in the early primary school years.

Keywords

Tablet technology · Child-centred apps · Improving early education

Measuring Learners' Interest in Computing (Education): Development of an Instrument and First Results

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Abstract

So far, there is hardly any empirical research on the question of what raises or influences the interest of school learners in computer science or computing education. Aspects to be considered are for example pedagogical decisions of the teacher concerning contexts [1], phenomena, situations, or concepts [2] to which a lesson or a lesson sequence refers, planned learner activities and many others. This paper analyses a model for describing interest in physics [3] on its transferability to computer science, reports about the development of an online questionnaire for investigating the computing-related interests of school learners and gives results of a first empirical pilot study (based on N=141 datasets). Based on the participants' answers concerning socio-demographical aspects, the computing interest of different groups of learners was analysed. A higher level of computing interest was found at male pupils, learners who indicated that they were striving for a computing-related job, that computing was their favourite school subject, or that they had good or very good school marks in mathematics or computing. Especially socio-cultural aspects met with little interest. This should lead to the examination resp. revision of the assigned items and the realization that an *interesting* instruction can be particularly important here.

Keywords

Learners' interest · computing interest · secondary education · questionnaire · empirical study

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Large effect size studies of computers in schools:
Calculus for Kids and Science-ercise

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Abstract

This presentation describes two computer-based interventions in Year 6 (age 11-12 years) classrooms. The interventions positioned sophisticated software alongside multimedia learning materials to teach topics from curriculum objectives many years ahead of these students' chronological ages. These were transformative interventions [1], changing what and how students learn when using computers. Students solved real world problems using integral calculus (*Calculus for Kids*) and studied both special relativity and quantum mechanics (*Sciencercise*). *Calculus for Kids* was conducted with 478 students in 26 schools from five Australian states; and *Sciencercise* was conducted with 187 students in five Tasmanian schools. Student learning achievement was measured using calibrated items in a post-test, with the students able to use the sophisticated software during the test. The results showed a majority of students exhibited learning achievements 4-6 years above their chronological age when using suitable computer tools. The studies bring into question the correct way to calculate effect sizes for such high impact interventions. Relying on [2], we estimate this transformative use of computers in education achieved an effect size >4.0, well above the hinge point of 0.4 for a significant innovation [3]. This approach offers a pathway to shorten the time between knowledge generation and its incorporation in school curricula.

Keywords

Computers · effect size · calculus · advanced physics · primary/elementary schools

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A Survey of the Prior Programming Experience of Undergraduate Computing and Engineering Students in Ireland

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Abstract

It has become apparent that increasing numbers of students arriving into undergraduate computing and engineering degree programmes in Irish 3rd-level institutions have prior experience of computer programming. As the extent of this prior exposure as well as its nature, origins, and usefulness is not known beyond anecdotal evidence, an annual survey of prior programming experience of freshman undergraduates who study programming as part of their degree has been designed and administered. This paper reports on the first two years of this survey in 2015 and 2016. It found that around one third had some prior experience of programming with nearly half of that group reporting a reasonable level of fluency in one or more languages. The authors expect that the effect of proposed changes to primary and 2nd-level curricula alongside the increasing popularity of informal programming clubs will be increasingly felt in coming years and therefore plan to continue and extend the survey in order to clarify the effect of such developments. The results should be of interest to 3rd-level educators in the planning of curriculum and teaching practice.

Keywords

Computer science education · Programming experience · CS

The King Island Digital Stories (KIDS) Project: Telling Stories for Tomorrow's Learning

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Abstract

The King Island Digital Stories (KIDS) project was an initiative to extend children's literacies through developing digital stories. The project was conducted over a ten-week term with 21 children in a Year 4/5 class. An ethnographic approach was used where the research team worked collaboratively in the classroom to scaffold individual children to represent their story ideas. The children were told that their stories needed to be about King Island and in their voice (first person) but otherwise, the stories could be about any aspect. The project was slow to start but a weekly sharing session helped the children to conceptualise and develop their stories. As the resources began to emerge, it was evident that the children were engaging effectively with the process of digital storytelling and developing their literacies, especially digital literacies. The resulting digital stories were diverse but collectively they communicated a tapestry of life on the island through the children's eyes.

Keywords

Digital storytelling · literacies · digital literacies · sense of place

Book of Abstracts

Students' Choices in Writing: Using ICT combined with Self-Regulated Strategy

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Abstract

The process of learning how to write is demanding, slow, and complex. Primary school students can experience problems in writing and teachers should provide scientific validated strategies to empower their performance, such as Self-Regulated Strategy Development (SRSD). Reflecting on the changes in the social reality and students´ interests it is also relevant the inclusion of Information and Communication Technologies (TIC) in the educational context and practice of writing. However, using ICT associated to other teaching methodologies is not always explored in the classroom. We constructed a SRSD+ICT model based on ICT educational models and Evidence Based Practice (EBP) combined with the SRSD. This model enabled students to self-control and self-assess their own writing behavior and learning, using ICT. Using a quasi-experimental methodology, we analyzed the impact of two different interventions, SRSD+ICT and SRSD, in 178 4th grade student's performance of writing opinion essay, divided equally in two groups, after 12 weeks instruction (90 minutes/week). Both interventions showed positive results in the students' writing but SRSD+ICT model was better. These results reinforce the pertinence and usefulness of this model in the teaching-learning process of writing that should be discussed and tested in different contexts.

Keywords

Writing · Self-Regulated Strategy Development · Information and Communication Technology · primary education · Evidence Based Practice

Involving everyone: Using the "Literacy from Scratch" project to develop the Computing and presentation skills of FE students with learning difficulties and disabilities (LLDD students), aged 18 to 24 years, and of their Learning Assistants

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Abstract

"Literacy from Scratch" is an international classroom project designed to develop computer coding skills (now a part of the new "Computing" curriculum in England) alongside literacy development, using the MIT visual coding language, Scratch. This project has now been extended upwards from ages 5 to 14, to include trainee teachers at Brunel University London, as well as LLDD students, aged 18 to 24 years, at an FE College in Lambeth, south London. The paper explores the potential for this latter, largely under-represented, group of students to improve their communication skills, while learning elementary coding. In the most recent phase of the project (Spring 2017), we have also included a small-scale study comparing PowerPoint and Scratch as tools for supporting the presentation of these students' ideas, and their literacy development. Classroom support staff, (called Learning Assistants, or LAs in England) were also encouraged to develop their teaching and learning skills throughout this project.

Keywords

Coding · LLDD students · Learning Assistants · Scratch · PowerPoint

Book of Abstracts

Peer Affective Factors in Peer Collaboration:
Facebook-based Collaborative Writing Activity among Turkish High School EFL Learners

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Abstract

School classroom contexts in English a Foreign Language (EFL) course in Turkish High Schools tend to be formally organised, highly structured, teacher-centred, with limited opportunity for student to student interaction and very little time for students to explore the language in its written form. Facebook as a highly popular social medium in Turkey enthused the Turkish students in this study to undertake a collaborative writing activity in English.

This paper is about an investigation of student perceptions of peer affective factors during a Facebook-based collaborative writing activity among Turkish high school EFL learners. Two groups of three students, 16-year-old EFL learners at A2 level English proficiency (CEFR), undertook an online collaborative English short story writing exercise over seven weeks using Facebook. I gathered data from focus group discussions, online one-to-one chats and online discussion threads from both groups. Peer affective factors, which were found throughout the writing exercise were prominent, and were concerned with receiving / giving praise and motivational phrases, the use of informal language and humour in writing during the exercise as well as in relation to feeling comfortable with each other when working together. The students claimed these factors greatly aided the development of their writing skills.

Keywords

Foreign language learning · web-based collaborative writing · affective factors in collaboration

Learners' Experiences in a Multicultural Remote Collaborative Learning Environment: A case of ICT4D Course

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Abstract

Collaborative learning is advocated because of its pedagogical advantage, which allows knowledge construction through group discussions among learners. In a collaborative learning environment, there will be many learners with diverse cultures. The pedagogical advantages of collaborative learning include learners from different cultural orientation sharing unique learning experiences. The purpose of this study is to investigate learners' experiences in a multicultural remote collaborative learning environment among three countries, South Africa, Kenya and Finland. An Informational and Communication Technology for Development (ICT4D) course was offered to 51 online students from three Universities in the countries mentioned. The course was group-work focused and groups were comprised of students from different Universities. A questionnaire was designed and distributed online to these students. The objective of the questionnaire was to assess students' experiences in a remote collaborative, tools used and knowledge sharing in the course. Research findings indicated that students utilized well synchronous and asynchronous communication technologies but also faced challenges like time differences and unequal contribution and participation in groups. However, team work of the students was excellent owing to the fact that 17 students managed to achieve the goal of the virtual learning for ICT4D course through remote collaborative learning.

Keywords

Collaborative learning · multicultural · learners' experiences · Universities· ICT4D

Modelling e-learner comprehension within a conversational intelligent tutoring system

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Abstract

Conversational Intelligent Tutoring Systems (CITS) are agent based e-learning systems which deliver tutorial content through discussion, asking and answering questions, identifying gaps in knowledge and providing feedback in natural language. Personalisation and adaptation for CITS are current research focuses in the field. Classroom studies have shown that experienced human tutors automatically, through experience, estimate a learner's level of subject comprehension during interactions and modify lesson content, activities and pedagogy in response. This paper introduces Hendrix 2.0, a novel CITS capable of classifying e-learner comprehension in real-time from webcam images. Hendrix 2.0 integrates a novel image processing and machine learning algorithm, COMPASS, that rapidly detects a broad range of non-verbal behaviours, producing a time-series of comprehension estimates on a scale from -1.0 to +1.0. This paper reports an empirical study of comprehension classification accuracy, during which 51 students at Manchester Metropolitan University undertook conversational tutoring with Hendrix 2.0. The authors evaluate the accuracy of strong comprehension and strong non-comprehension classifications, during conversational questioning. The results show that the COMPASS comprehension classifier achieved normalised classification accuracy of 75%.

Keywords

Conversational intelligent tutoring systems · Adaptive e-learning · Comprehension assessment · Machine learning

Online environments as Third spaces for teacher education

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Abstract

Within teacher education there is a call to re-think traditional models of in-school professional or field – based experience to strengthen the theory practice nexus. Drawing on the theory of Third Space, leading thinkers and researchers in the field are suggesting that teacher educators create alternative paradigms for teacher education, that allow for new ways to link theory and practice. Using the theoretical lens of Third space, this paper examines one such attempt to create an alternative, hybrid space for teacher education in an online environment, eTutor, where preservice teachers took on the role of online tutors to schools students from their own and another country The paper shows that an online environment as a Third space for teacher education is not without limitations but can provide a transformative learning space that requires students, in this case, preservice teachers, to explore completing knowledge and ideas to develop new understandings of self and what it is to teach.

Keywords

Online environment · teacher education · Third space

Online Teaching and Communication: Emotions in Computer Mediated Communication

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Abstract

The current education system and workplace emphasise teamwork, technology and globalization. These core concepts are central to Computer Science and the software development industry, where collaboration in virtual teams, across international boundaries, is commonplace. Computer mediated communication (CMC) facilitates emotions, but in a rather different dimension than face-to-face communication. To express emotions in CMC most common cues are Emoticons and Paralanguage. This paper will present results from a project wherein three international higher educational establishments collaborated on a computer mediated communication software engineering project. The paper will present the types of uses of emoticons and paralanguage cues used by students in their interactions. The work reveals the influence of emotion in the communication between students in a collaborative space.

Keywords

Computer mediated communication · higher education · education · computing · distance learning

Inspiring Tomorrow's Leaders: Computing to Digital Media

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Abstract

Since 1992, the MirandaNet Fellows have developed international Continuing Professional Development (CPD) programme called iCatalyst, based on extensive national and international research. This programme is underpinned by practice-based research where teachers as co-researchers publish examples of EdTech practice in order to develop and share a professional knowledge base. In this paper Fellows from industry, research and a UK school explain how, using iCatalyst methods, they gathered practice-based evidence to inform school leaders about the value of changing from the existing Computing curriculum to Digital Media. The leader of the CPD and the adviser from a university benefit from the support of Gaia Technologies, a MirandaNet associate company engaged in research and development as well as providing the school's digital infrastructure service. This technical and production support is not only valuable in the project's success, but also gives the pupils an opportunity to understand how their new skills can be used in the world of work. Whereas the first year ends with approval from pupils, sustainability is impacted in the second year by the change of head and funding reductions. A cautionary tale for those proceeding with innovation in a hostile political climate.

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Keywords

Professional development, computing, digital media, leadership, funding constraints

Digital Schoolhouse powered by PlayStation: Using Play-based learning to inspire the next generation

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Abstract

The pioneering Digital Schoolhouse programme combines inspires and engages learners and their teachers with creative computing. After the success of the pilot programme, which supported 9000+ learners & 1000+ teachers in 18 months; we have expanded the programme to 20 Digital Schoolhouses across the country.

From the point of view of the learners they're going on a school trip, for their teachers it's a unique approach to their Professional Development, primarily through team-teaching. By the end of the workshop, many teachers have gained enough confidence to begin teaching the materials themselves. With externally validated results we've proven impact, e.g. 100% of participating teachers reported improved confidence and motivation to engage with computing. The workshops also significantly improve pupil attainment and effectively tackled common misconceptions.

The programme combines the passion and experience of the classroom to deliver computing concepts and computational thinking with innovation and expertise through collaboration with academia and industry to provide free, creative computing workshops. The project employs the use of unplugged style activities, play-based and cross-curricular learning. Unplugged activities include teaching computing through dance and networking; jigsaw puzzles, word games and role play as part of our play-based learning approach and all our workshops have a cross-curricular focus.

Keywords

Play-based Learning . Cross-Curricular . Creative . Computing . Computational Thinking

"ICTs in the Air", a program for ICT-talented learners

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Abstract

Because of the predicted shortage of ICT workers a local program has been set up to make young students (age 14-18 y) more enthusiastic about informatics and ICTs. In the program students perform assignments that are created by local ICT companies and institutions. The program is open for older students to get a grade for the subject informatics and for younger students to recognize their interest in ICTs at all.

The program for a student lasts for 1 or 2 years and consists of four different projects in one year. The subject content is delivered through so called "batches". In general the students are rather satisfied about the setup of the program. They like the topics, the guidance and most of them are considering a follow up study in the ICTs. They want more variety and depth in the projects. We conclude that the program is stimulating young people to consider a study in ICTs and it provides an more longitudinal curriculum to higher ICTs Education. Problematic is to find the right pedagogical approach in the program for all different students to organise and finance it, and to involve companies and institutes for higher education.

Keywords

Informatics · curriculuma · secondary · education · shortage ICT-workers

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8. See: www.ictindewolken-almere.nl
9. See: https://nl.surveymonkey.com/results/SM-B27YRR8G/

Game-based learning and gamification of learning and instruction Symposium

Abstract

The development of alternative pedagogies to traditional approaches is becoming increasingly important as a means of enhancing the attractiveness of training courses, receiving new types of learners and designing learning systems that help to develop skills rather than strictly disciplinary knowledge [1,2]. Within this context, game-based learning and gamification of learning and instruction [3] are now considered to offer new opportunities for educators. Since gamification is intended to foster student's motivation with rewards, games are usually considered to offer the player the opportunity to explore a physical or human manifestation of this world [4] and to express their own creativity [5]. It is expected that players will learn the "ways of acting, interacting, and interpreting that are necessary for participating" in real situations [2]. Games also play the role formative assessment systems [6] where players can assess their way of thinking and behaving.

This symposium aims to give the presenters the opportunity to compare their different approaches for the integration of games and gamification into learning contexts. What are the core theoretical backgrounds of their projects? What are the difficulties faced for their implementation? Which issues are addressed? Which research questions are asked? How are they addressed? What are the lessons learned from these projects?

Keywords

Game-based learning · gamification

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Social Engagement in a Digital Role-Playing Game dedicated to Classroom Management

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Abstract

Classcraft, available as a mobile and web application, is a role-playing game for classroom management in high schools [1]. Teachers can create teams and assign an avatar to students, as well as points and 'powers' as rewards for desired behaviour. Classcraft aims to foster players' social engagement.

We conducted a preliminary study on 6 classrooms from Switzerland. The objective of our study aims to characterize the social component of players' engagement and its evolution. Our approach is based on the identification of engaged-behaviors [1]. Bouvier et al. [2] consider that players' engagement encompasses four components. The environmental component is in relation with the autonomy need, the social component is in relation with relatedness, the self-component relates to the autonomy need and the action component is in relation with the competence and autonomy needs.

We developed a methodology based on *learning analytics* [3] to monitor players' behavior. The detection of engaged-behaviors is based on the collection and analysis of players' digital traces of players' actions. Different categories of players emerged in terms of social engagement. In addition, the data collected shows that social engagement varies across time. This variation seems linked both to specific features of the game and to teachers' decisions as game-master.

Keywords

Game-based learning · Classroom management · Social Engagement · Learning Analytics

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Exploring young people's views of digital games and learning

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Abstract

With technology becoming commonplace in classrooms, teachers can more easily adopt digital game-based learning approaches. These approaches "can unintentionally disadvantage students with less prior game experience" [1]. Gender differences include boys spending more time gaming than girls, thus developing more sophisticated game playing skills [2]. With less experience, girls see less potential for games in learning than boys do [3].

This paper concerns research investigating a collaborative quiz demanding competitiveness, team play and risk-taking. Boys are more competitive than girls, thus benefitting from a positive impact on learning outcomes. Risk-taking in games has a positive impact on engagement and learning but more so for girls than boys. To maximize potential benefits of digital game-based learning in the classroom, more consideration should be given to designing for inclusivity.

Drawing on a survey of 117 boys and 121 girls (12-13 years), and focus groups held separately with boys and girls, this paper provides a critical perspective on game-based learning in school classrooms. Our data confirms that gender differences remain. Through analysis of qualitative data, we probe more deeply into the reasons underpinning young people's attitudes to game-based learning. This paper will present those findings and reflect on their implications for future practice.

Keywords

Game-based learning · secondary · education · gender differences · inclusivity

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Stimulating and assessing transversal skills with digital games: the case of logic and spatial reasoning

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Abstract

This contribution is focused on the role that digital mind games can have in stimulating and assessing primary school students' transversal skills, that is, those cross-skills that are at the basis of the learning of many different disciplines. Thinking skills and, more specifically, logic and spatial reasoning skills are in particular considered. Early activities in this field appear to be particularly effective, especially if we consider that thinking skills develop slowly and that primary school offers usually a more flexible context, both as far as curricula constraints and time organization, to introduce non-traditional activities. A number of field experiments carried out in primary school classes highlighted the pedagogical potential of mind games to support and foster problem solving and reasoning skills and showed that their use under certain conditions may also have a positive impact on school performance in curricular subjects such as mathematics. The research studies performed allowed to face the topic according to complementary perspectives:
- Analysis of the skills involved in the use of a selected number of mind games [1];
- Impact of the use of mind games on school performance, behaviour and attitudes [2, 3];
- Analysis of interface and game mechanics features that make mind games more or less suited for learning [4];
- In particular, investigation of the relationship between immersion in virtual reality, presence and performance in spatial reasoning [5].

Keywords

Games based learning · reasoning skills · mind games · primary school

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A Demonstration of Evidence-Based Action Research using Information Dashboard in Introductory Programming Education

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Abstract

In this paper, we demonstrated an evidence-based action research in an introductory programming class with the use of an information dashboard which provides coding metrics to visualize students' engagement of their assignments. The information dashboard was designed for teachers to improve their classroom teaching using the same coding metrics which was verified in our previous research [1]. The system was equipped with a cross-filter functionality for exploring the entire classroom metrics. Accordingly, teachers can easily conduct a temporal analysis, an across-year comparison, and a cross metrics analysis. We examined the system for the improvement of the 5th year course using a dataset from the past four years from a non-CS introductory programming course at a university. Qualitative analysis was conducted using the discourse between teachers and teaching assistants with the proposed dashboard. The results showed that the system succeeded in promoting discourse, which included a clearer understanding of the class and its improvement, such as teaching method, assignments, or of students' behavior.

Keywords

Programming education · Information dashboard · Learning analytics · Action research

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Utilizing the Repertory Grid Method to Gain Information about Learners' Perceptions of Computer Science Concepts

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Abstract

When it comes to studying learners' perceptions, the most common methods range from arranged questionnaires to carefully structured interviews. While the former are arguably inadequate to understand learners' perceptions correctly due to the lack of response, the latter lack the ability to flexibly focus on interesting points during the interviews. Since the importance of learners' perceptions is well-known and many Computer Science concepts are not covered yet, we want to introduce a technique from the field of social psychology and apply it to the domain of *Computer Science Education*. With our field report on *"Utilizing the Repertory Grid Method to Gain Information about Learners' Perceptions of Computer Science Concepts"* we want to encourage this qualitative approach in this field. We present our application of this method in order to study five 11- to 13-year-old secondary school students' conceptions of the Internet and the corresponding IT devices. It turns out that the technique is a promising alternative when it comes to studying learners' perceptions indeed.

Keywords

Learners' perceptions · Repertory Grid Technique · Personal Construct Psychology · Computer Science Education · Computer Science concepts

Computing Camps for Girls – A First-Time Experience at the University of Limerick

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Abstract

Increasing the number of females in ICT-related university courses has been a major concern for several years, also at the University of Limerick. In 2015, we offered a girls-only computing summer camp for the first time, as a new component in our education and outreach activities to foster students' interest in our discipline. We describe the motivation for the camp and how we designed the program, and we report our experiences and survey findings from the first two editions of the camp. They can provide guidance for planning further events targeting females, and help to integrate an awareness about underrepresentation of females in other activities.

Keywords

Computer science education · programming · computational thinking · modelling · women in STEM

Digital Tools in Education: Case Finland

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Abstract

This short national perspective paper discusses recent technological developments in the Finnish educational system. Particular emphasis is on the ways in which three elements affect it: the new digital matriculation examination, the rise of programming and robotics, and the ways in which a lack of sufficient digital educational material is inspiring the development of new pedagogical methods. The paper concludes with some viewpoints on where the situation is heading next.

Keywords

Curricula · digital education · programming · robotics

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Ukrainian Educational Standards in IT field and their link to Professional Standards

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Abstract

The article covers necessity, concept and role of professional standards for the system of IT-industry and IT-education, as well as international practice of their use. A structure and content of professional IT standards in Ukraine are also described. It is proved that professional standards provide the sphere of education with the necessary information about areas and objects of professional activity of graduating students, their kinds, tasks and necessary competences of future specialists.

Keywords

IT-industry . IT-education . professional standard . educational standard   competence

Towards a framework for developing the emotional intelligence of secondary school students through the use of VLEs

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Abstract

Although increasingly schools are using Virtual Learning Environments (VLEs) to teach students and society now understands the importance of Emotional Intelligence, the VLEs currently installed in schools can be said to be 'emotionally unintelligent' and do not help to inspire and encourage students to become emotionally self-aware, empathetic and responsible citizens. Meanwhile, designing a VLE that is emotionally intelligent and consequently responsive to students' emotional and academic needs remains a challenge for both developers and educators. By adopting a process of inductive reasoning, this study draws upon the perceptions of 150 students, 35 teachers and 5 learning support assistants (LSAs) from one secondary school in London as well as 2 VLE Content Developers, to propose a framework which, it is argued, can support teachers in helping their students to develop both Emotional Intelligence and academic abilities. Data collection methods used included semi-structured interviews, questionnaires as well as staff and students' focus groups. 5 approaches towards validation (context-based, theory-based, criterion-related, response and consequential) are used to enhance the credibility of findings. Primarily, this paper aims to stimulate thinking and consequently knowledge that will lead to the design of VLEs that emphasise and capture the emotional dynamics of classrooms and society.

Keywords

Emotional Intelligence . VLEs . Secondary schools . Education

The use of technologies in collaborative learning practices. Secondary school perspective

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Abstract

Technologies are a part of learning process not only providing information, but helping to collaborate and enhance the process itself. The main aim of this research is to find out what kind of software and technologies secondary school teachers use in collaborative learning practices. In Lithuania's public schools there is traditionally well-established frame of conventional lesson structure. New technologies, which are coming to nowadays schools, should be integrated in the same structure and enhance teaching and learning.

In this research, 411 respondents participated, 374 of them were women (91%) and 37 men (9%). This is a fairly good reflection of the entire population of Lithuanian teachers. This article presents a small part of the bigger research made in Lithuania schools. Presented results show that the most popular software among teachers is web browsers and presentation programs, and teachers are most likely to use multimedia projectors and interactive whiteboards.

Keywords

Collaborative learning . information communication technologies . secondary education

A Software Development Process for Freshman Undergraduate Students

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Abstract

This conceptual paper presents work which is part of an ongoing research project into the design of a software development process aimed at freshman, undergraduate computing students. The process of how to plan and develop a solution is a topic that is addressed very lightly in many freshman, undergraduate courses which can leave novices open to developing habit-forming, maladaptive cognitive practices. The conceptual software development process described in this paper has a learning process at its core which centres on declarative knowledge (in the form of threshold concepts) and procedural knowledge (in the form of computational thinking skills) scaffolding freshman software development from initial planning through to final solution. The process - known as Computational Analysis and Design Engineered Thinking (CADET) - aims to support the structured development of both software and student self-efficacy.

Keywords

Introductory software development process · computational thinking · threshold concepts

Ontology-based Backward Learning Support System

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Abstract

One of the main goals of introductory courses of a university is to make freshmen well prepared for subsequent intermediate courses. But nowadays it becomes difficult because academic skills of freshmen differ very much. To resolve this problem, this paper proposes an ontology-based backward learning support system called EduGraph. If a student cannot understand some learning item, EduGraph, based on its ontology, suggests him or her prerequisites for understanding the item, and he or she can learn them using EduGraph. For the student, to understand the incomprehensible item can be a short-term goal because prerequisites for it are suggested, and he or she is expected to keep intrinsically motivated to understand the item. EduGraph can also support a student to organize what he or she learns into his or her integrated knowledge, because its ontology is based on a well-designed upper ontology for learning and can organize learning items properly. Actual applications to several introductory courses from 2015 suggest that EduGraph is effective.

Keywords

Ontology · concept map · backward learning · intrinsic motivation

Understanding the Differences Between Novice and Expert Programmers in Memorizing Source Code

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Abstract

This study investigates the difference between novice and expert programmers in memorizing source code. The categorization was based on a questionnaire, which measured the self-estimated programming experience. An instrument for assessing the ability to memorize source code derived from the work of Adelson [1] was developed. Also, well-known cognitive tests for measuring working memory capacity and attention were used, based on the work of Kellog [2] and Hayes [3]. Forty-two participants transcribed items which were hidden initially but could be revealed by the participants at will. We recorded all keystrokes, counted the lookups and measured the lookup time. The results suggest that experts could memorize more source code at once, because they used fewer lookups and less lookup time. By investigating the items in more detail, we found that it is possible that experts memorize short source codes in semantic entities, whereas novice programmers memorize them line by line. These results will be integrated in future item designs to assess object-oriented programming competency [4]. Because our experts were significantly better in the performed memory capacity tests, our findings must be viewed with caution. Therefore, there is a definite need to investigate the correlation between working memory and self-estimated programming experience.

Keywords

Assessment · object-oriented programming · working memory · programming experience

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Book of Abstracts

Boundary crossing – Home, School and digital practices

Symposium Abstract

The papers within this symposium take different perspectives on data from New Purposes, New Practices, New Pedagogy (NP3 – see www.np3.org.uk) – a research project that is exploring the digital practices that children engaging with outside school and the extent to which these are recognised, valued and influencing practices inside primary schools in the UK.

Thus, the symposium explores digital practices and boundary crossing between home and school, exploring issues to do with what digital practices are enacted in different settings, identities and digital practices, the extent to which children's digital practices do (or can) migrate between home and school, and social justice. More specifically:

- Paper 1 frames the debate, explaining the key research questions that NP3 set out to investigate, how these questions emerged from previous research, the theoretical framing for the project, and its methodology
- Paper 2 begins to explore digital practices in different arenas
- Paper 3 Explores the role of parental perception in the mediation of children's access to digital technology and spaces
- Paper 4 looks at issues to do with social justice and pupils' digital practices

The symposium will consist of a 15 minute presentation on each of the four papers, followed by 30 minutes for discussion.

Keywords

home · primary school · digital practices · socio-cultural · social justice

Acknowledgements

Boundary crossing – Home, School and digital practices

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Abstract

Mobile devices are impacting on children's and teachers' practices in primary schools (e.g. Clark, Twining & Chambers, 2014) and are blurring boundaries between formal, non-formal and informal learning (Falloon, 2015; Passey, 2010). Emerging evidence (Maher & Twining, 2016) shows pupils are perceiving affordances between their practices in informal learning settings and their learning in schools, demonstrating an evolving adaptive expertise (Rogoff, 1995) and concomitant experience of agency in their learning. However, teachers are slow to incorporate these new digital practices within their pedagogy (Maher & Twining, 2016). It is important that teachers do recognise and value pupils' new practices in order to enhance their formal learning (Gurung and Rutledge, 2014).

New Purposes, New Practices, New Pedagogy (NP3) focuses on the use and impact of mobile devices on innovative pedagogic practices, social justice, and pupils' development of digital literacy within UK primary school communities. We understand ICT as mediational means that shape action possibilities and take a sociocultural methodological lens where practice emerges in social and institutional contexts, which mediate the possibilities for what teachers and their pupils can do and be.

This paper will frame the other papers within the symposium, providing an overview of previous work on mobile devices in schools, setting out NP3's theoretical stance, and outlining the methodological approach taken (including providing and overview of the data collection methods and analysis).

Keywords

mobile devices · practices · children · teachers · methodology

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Digital practices in different arenas

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Abstract

The paper explores how teachers' intended and enacted pedagogic practices demonstrate their awareness of and value given to pupils' digital practices in the 'outside school' arena. The paper also considers the range of factors shaping children's digital experiences within the 'school' and 'outside school' arenas and the extent to which there is a congruence of digital affordances, purposes and values in these arenas.

The diversity of children's digital practices in the arenas of inside and outside school are explored within a socio-cultural framing and includes an examination of :

- The discernible cultural differences between the arenas and the impact of this on children's developing repertoires of digital practice (Stevenson, 2013)
- Differences in the perceived purpose of engaging in digital activity linked with identifiable communities of practice and identities (Wenger and Lave, 1991; Thomas, 2005)
- The impact of diverse concepts of 'learning' and 'teaching' and curriculum-led expectations on pedagogic practice and school-based digital practices (Furlong and Davies, 2012) and the extent to which children and teachers agentically utilize out-of-school repertoires of digital practice to reshape pedagogic practices Rogoff, 2007)
- Differing images of the 'the child' and the tension between children's protection rights and their right to protection (Livingstone and Third, 2017).

Keywords

digital practices · children · teachers · pedagogy · agency

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Developing Digitally: Parental Mediation, Perception, Opportunity and Constraint

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Abstract

At the interpersonal level (Rogoff 1993), parent and teacher perceptions of legitimate use and access to ICT play a key role in terms of enabling or constraining children's use of digital technology and access to digital spaces. This paper will draw upon the concept of 'parental mediation' (Clark, 2011; Livingstone et al, 2015) to explore data emerging from NP3's research, focusing on the 'home into school' digital practices of primary school children in the UK.

Within the conception of the NP3 research the home is recognised as a significant site of learning. In adopting a sociocultural approach research has paid particular attention to the development of digital practices, identity and in turn the notion of digital competence. The NP3 research included observations of children's use of ICT in school, interviews with parents and children and the documentation of home ICT use through photographic logs.

This paper will explore the role of parent perceptions and ethnographies (Marsh et al, 2015; Plowman, et al. 2008; Plowman, 2010) and their influence on mediation by drawing upon at least two cases arising from the NP3 project data.

Keywords

Parent · child · mediation · negotiation · Digital technology

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Children's digital practices and social justice

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Abstract

This paper discussses NP3 findings from a social justice perspective (RQ4). It examines the sociological and socio-cultural factors that affect boundary crossing of children's digital and social practices and identities from home to school.

It raises questions including:

- Which children's (if any) out-of-school digital practices are valued at school and in what ways are they integrated (if at all) as pedagogical tools?
- What are the institutional factors that constrain and/or enable the digital practices of children with different social identities? (Grant & Engdahl 2014)
- What does this mean for different children's capacity to exercise learner agency at school?
- What are the consequences (if any) for understanding the 'digital divide' between more or less advantaged children? (Hohfield et al 2008)

The paper will focus on children in one or more case study schools which may be positioned as 'disadvantaged' (Lupton & Hempel-Jorgensen 2012). It will examine the nature of children's out-of-school practices and in which ways (if at all), they are valued by teachers and impact upon pedagogical practices. In addition to NP3's theoretical framing, the paper will draw upon concepts such as Funds of Knowledge (Gonzales, Moll and Amanti 2005) and Funds of Identity (Esteban-Guitart & Moll 2014).

Keywords

Social justice · identity · practices · digital divide

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ICT and Education interventions in India: Challenges in implementation in government schools

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Abstract

This symposium paper draws from three currently implemented ICT in education projects by NGOs in government schools in India. These interventions can be classified as driven by digital content or project based learning using ICT. The objective of the study is to understand factors that teachers find challenging in implementation across these three projects. Inadequate ICT infrastructure in education has been well documented in the literature as the main barrier for ICT in education use by teachers in the developing countries [2&3]. However, the internal variables of teachers like teacher competence [4 and 5] and exposure to professional development in ICT [1], and teacher beliefs [7] about technology use are also found to be major challenges in implementing ICT. A sample of government schools teachers were interviewed at their respective three projects to gauge challenges they face in implementation. The interviews also explored the value teachers attach to their ICT enabled projects. The data indicated that regardless of the nature of ICT intervention (content or pedagogy focused), a majority of the teachers across the interventions reported external factors- technology infrastructure, connectivity, power, and poor computer/digital tool to student ratio as the main challenges they faced in implementation. On the other hand, the value teachers attached to these interventions varied as per the specific nature of the intervention.

Keywords

ICT challenges · developing countries · India · government schools · NGOs

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eExam symposium: design decisions and implementation experience

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Abstract: Outline of the eExam symposium theme

Increasingly, student learning is online or computer-mediated. Keyboards and screens are replacing pens and books. This is just as true in schools as in universities. These educational institutions are socially conservative, especially with respect to high-stakes assessments that credential the awards they make. Gradually, computer-based assessments are being trialed, in a multitude of forms.

This symposium brings together a diverse group of such trials. Geographically diverse, they represent a variety of approaches to eExams. Some use institutional equipment in dedicated spaces on campus. Others allow candidates to use their own computer, either under a security blanket or by booting from an alternative to the internal hard-drive. Each of these technological approaches has different sets of educational affordances.

We are still evaluating the benefits and barriers for these different approaches. Some institutions value the time saved for teaching staff through automated marking. Others look at the entire assessment reticulation process, from examination composition to return of marks to candidates. Yet another group look at the potential for curriculum transformation arising from computer use at the assessment stage.

I invite participants to share their design decisions and practical implementation experiences. Going forward, we may see commonality emerging that will make eExams convenient, reliable and educationally beneficial.

Keywords

eExam · computer · assessment · high-stakes

E-exams at the University of Iceland

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Abstract

E-exams at the University of Iceland can only be taken on computers that are wired into the campus network (i.e. in computer labs). The examinee is given a username and a password that are only valid for the exam in question. Access to the Internet can be controlled; students of law are, for example, permitted to access the Archive of Icelandic Law on-line.

Access is always given to Microsoft Office. Two directories are open to examinees: „Fetch", where they open the examination itself along with permitted digital aids; and "Save", where their solutions are stored. Students log-in for each e-exam, and then all their activities and time of saving documents are monitored on-line throughout the e-exam. Once the examination is over, all the solutions are saved to the home directories of their teachers.

Pros and cons of this arrangement will be shared with the audience.

Keywords

eExam · computer · Iceland

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Transforming exams across Australia: Processes and platform for e-exams in high stakes, supervised environments

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Abstract

Electronic examination and assessment systems pose a challenge in both finding and/or creating a solution that is effective and practical from a real world and software engineering perspective. Any proposed solution must be flexible to allow for a range of assessments, taking into account the requirements and expectations of multiple stakeholders such as student, teachers, administrators and technical support. This includes being easy to use, open enough to prevent vendor lock-in, practical to implement, secure and efficient to support.

In this presentation, we explore the current incarnation of an e-Exam platform, in particular its approach of using purely open source components, the mechanics of the system and design decisions taken in developing a modular and automated foundation for a systematic electronic learning and assessment approach. This, together with a Bring Your Own Device strategy for hardware provision demands a high level of common hardware compatibility in an ever-changing technology landscape.

Keywords

eExam · computer · Australia

Design choices for SafeExamBrowser

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Abstract

SafeExamBrowser (SEB) is a kiosk or lockdown browser, which secures computers used as exam clients, while an exam running on a web server is taken. SEB is open source and available as freeware currently for Windows, MacOS and iOS devices. SafeExamBrowser generally works with any web based e-assessment system. A growing number of learning management and exam systems provide additional integration with SEB for increased security. Besides running online exams in its built-in web browser, SEB can start third party applications, which have been permitted to be used during the exam. Initially targeting exams taken on managed lab computers, current versions of SEB can also be used for increasingly popular BYOD exams. We will discuss choices made while designing SEB, focusing on its modularity, openness and independency from a centralized server or cloud service, which has led to SafeExamBrowser being used worldwide for various kinds of e-assessments.

Keywords

eExam · computer · Switzerland

The Secure-Exam-Environment:
eTesting at the Alpen-Adria-Universität Klagenfurt

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Abstract

The manifold advantages of online-testing face a plethora of technical as well as organizational challenges. Usually, computer rooms at educational institutions are far too small for large online-exams. Looking for a sustainable possibility for mass online-testing, we have developed a system to make use of students' own devices, restricting the access to the internet, own files and external devices. This is realized by booting a Linux-image via network (PXE). Next to security issues, this enables us to use supplementary software for testing like spreadsheets, programming or mathematical tools in addition to our LMS Moodle, through which all online exams are executed. As an additional service, we offer slot-exams online, allowing students to choose freely the time and day of their exam during one predefined week. Nonetheless, current challenges like missing LAN connections with latest hardware devices could be overcome by adapters and we are conceptualizing alternative solutions for secure online testing.

Keywords

eExam · computer · Austria

Exam in Finnish Universities

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Abstract

The Exam system has been built by Finnish Higher Education institutions and it uses the FunetEduPerson authentication system for each user for logging in – this provides links to institutional databases to identify the role (student/staff), e-mail address etc. Exam can be accessed with any web-browser – preferably Firefox or Chrome. The exams are taken in a dedicated Exam studios, where the access has been limited to the Exam server. Students can book a day and time for their chosen Exam studio. Questions can be opened one by one and can be answered in a rich text box answer space which can be expanded or made full-screen. Other question styles include auto-marked multiple choice questions. Mathtools can be used for equations. Throughout the exam, student responses are backed up onto the server every minute. Exam is excellent at supporting language testing in Finnish, Swedish and English; Russian will be added soon. Copy-paste functionality has reportedly improved the quality of student essays when using Exam.

Twenty-four universities across Finland are using the Exam system. About 10% of all exams in Tampere University of Technology use Exam (10 000 in 2016). Different types of software can be used to add attachments to the exams. These can be decided by the universities: which tools will be supported in Exam studios. Each university can have their own Exam server (e.g. exam.app.jyu.fi), or use one of the 8-9 instances in the CSC datacentre. Not only does the system link with student management systems to identify enrolments, it also integrates with academic administration systems to return assessment evaluations. Exam is being developed to support data exchange among universities: a student can take an exam in another Exam studio or exams can be graded by teachers in other universities.

Keywords

eExam · computer · Finland

Book of Abstracts

Error Recognition Model: End-user Text Management

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Abstract

Discussion, evaluation, and error recognition in natural language digital texts is one of the most neglected areas of the digital world, despite the fact that text management is the most popular computer related activity. Millions of erroneous text-based documents of different types are in circulation, without our being aware of how fragile, damaged and harmful they are. It is well accepted in programming and even in other end-user activities that error recognition plays a crucial role in teaching, learning and real world problem solving processes. In the present paper, we introduce the Error Recognition Model, which consists of the processes used in discussion and concept-based problem solving, and we also provide examples of the utilization of the model. We argue that error recognition and correction, and the assessment of problems in text management are as important as in other fields of informatics and computer sciences.

Keywords

end-user text management · error recognition and classification · error correction · high mathability computer problem solving

Evaluating acceptance of a haptic learning resource

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Abstract

The Technology Acceptance Model (TAM) was the basis of this study to investigate students' acceptance of a haptic learning resource in anatomy education. The haptic-anatomy system was developed with the Phantom Omni. A force-feedback pen was gripped by the user who saw anatomical organs on a screen and learned to identify them and their associated medical nomenclature. When any part of each organ was held and moved around, the user felt different haptic feedback depending on the hardness of the organ. The user groups were from three different university student cohorts with a total of 89 participants. The system was developed over three cycles using a design research paradigm. Based on the two main elements, *perceived ease of use* and *perceived usefulness* of TAM, this study used additional elements such as gender, prior experiences with similar resources, learning preference modes, and enrolled undergraduate courses to investigate students' learning achievement and acceptance. No significant differences were found between genders or enrolled courses in the acceptance of the system in terms of 'ease of use' and 'usefulness' of the system. Students with previous experience with 3D were more favorable to a haptic device, this was statistically significant ($p=0.025$) for "would use" and they also scored higher on the associated quiz ($p=0.050$, Mann-Whitney U test).

Keywords

Learning resource · haptic interface · anatomy learning · Phantom Omni

Innovations in Teaching and Learning in Higher Education using Haptic Simulators for Dental Students and other Health Care Disciplines

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Abstract

This paper reviews the effectiveness of teaching and assessment strategies developed over 10 years of trials using a haptic simulator to teach undergraduate Dental and Nursing Students. Haptics, meaning the sense of touch, is being used in simulators for teaching and learning of skills involving touch control and hand-eye co-ordination in an increasing number of Healthcare HE courses (e.g. San Diego, Cox, Quinn, Newton, Banerjee & Woolford, 2012; Wang D, Zhao, Zhang & Wang X, 2015) and has been shown consistently to enhance student learning (Shariari-Rad, Cox & Woolford. 2017).

For Dentistry, the hapTEL system simulates a Dental chair enabling students to operate a real drill on a virtual tooth in a virtual jaw. In this longitudinal study, 1200 undergraduate dental students have used the haptic simulators every year since 2008 and 25 nursing students in 2012. The teaching strategies have evolved to include a range of technology enhanced learning resources (TEL) in a blended learning setting to take account of yearly students' results and feedback. Consequently, the most effective use has been shown to involve the use of a blend of video recorded short lectures followed by face-to-face teaching, pair working, and individual student assessment log-file record keeping.

Keywords

Higher Education - Dental Education - Haptic Simulators - Assessment Techniques - Blended Learning.

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Agile development in software engineering instruction

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Abstract

Agile software development methods are replacing former, highly systematic project management practices in software development. Many studies have shown that agile methods are already a mainstream in software industry. The changes in development practices have entered education in the academia rather reluctantly. Much of the higher education still depends on very traditional teaching practices and conventional curricula. In this paper, we describe a series of efforts to bring the agile world fully to the ICT education, and discuss results for students and teachers alike. Agile methods can be taught, but they can also be part of the teaching toolkit. Formal curriculum planning constraints hinder the application of agile approach, though. Moreover, teachers of agile courses face certain personality requirements: they need to be able to tolerate uncertainty and to be professionally proficient because of demands for flexibility and quick adjustment. The results of using agile methods as course outline, as well as agile planning of course content in small instructor teams have been successful in our university.

Keywords

agile methods · ICT education · collaboration practices · project based learning · Scrum

Book of Abstracts

DIYLab as a way how student teachers can understand a learning process

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Abstract

The authors introduce their experiences gained in the EACEA project Do It Yourself in Education: Expanding digital literacy to foster student agency and collaborative learning (DIYLAB)[1] aimed to design an educational procedure based on DIY philosophy focused on digital literacy development and later to verify it in teaching practice in primary and secondary schools and HEIs in three European countries: Finland, Spain and the Czech Republic. A model of DIYLab learning activities is based on DIY philosophy and six educational principles of approaches to pupil's learning: collaboration among learners, inquiry-based learning, digital literacy development, support of interdisciplinary relations, promotion of autonomous learning, and curriculum contexts. In the Czech Republic at the Faculty of Education the project DIYLAB was realised, alongside other issues, in initial teacher education. DIYLab as a teaching approach was applied within 20 activities with Bachelor and MA degrees in ICT, Biology, Primary Education and Art Education student teachers. DIYLab activities were designed not only by teacher educators, but also by student teachers themselves who could bring a problem related to curriculum and concurrently to their after-school interests. Following the project, the DIYLab approach is being included in future Bachelor and MA level initial teacher education.

Keywords

Digital literacy · DIY · visualisation of learning process · student teacher · DIYlab

Informatics teachers' self-efficacy - a survey instrument and first results

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Abstract

The general concept of self-efficacy is based on the individual's own perception of being capable to handle challenging professional situations, for example in the fields of scientific knowledge, pedagogic expertise and conflict management. By means of existing literature, a questionnaire has been created to measure different aspects of self-efficacy in German informatics teachers as well as professional overload. Completed questionnaires of 58 informatics teachers have been analysed to investigate their perceived general self-efficacy and their informatics-specific self-efficacy. The results suggest that the majority of the surveyed teachers have a relatively high self-perceived overall self-efficacy and don't feel professionally overloaded. In contrast to other studies, this investigation determines no correlations between informatics teacher's general self-efficacy and their ratings of professional overload. However, there is only evidence for medium negative coherence between informatics teacher's self-efficacy in a very subject-specific area of informatics and professional overload.

Keywords

Self-efficacy · social cognitive theory · teachers' self-efficacy · computer science education · empirical study

Scaling A Model Of Teacher Professional Learning : Can we recreate deep learning conversations live online?

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Abstract

This paper describes an innovative model of teacher professional learning that evolved over a decade (2006 to 2016) and explores how this face-to-face initiative can be reconfigured in an online environment to enable scaling of access to this already validated model (Butler & Leahy 2015). Working in a range of different school contexts, this robust, yet, flexible model of professional learning meets teachers' expressed needs while also shifting their pedagogical orientations. The learning design supports school-focused, job-embedded teacher professional learning, which challenges more traditional instructional environments by infusing digital technologies and other elements of 21st century skills into the teaching and learning experience. Building on the experiences of implementing this model, the most recent phase attempts to harness the emergence of a 4th wave of online learning (Picciano, 2014) involving the design and development of a Massive Open Online Course (MOOC) that potentially enables scalability. The importance of maintaining key elements, threshold concepts and signature pedagogies in the design of MOOCs for teacher professional learning are discussed. Finally, challenges are identified relating to the design of the social supports within the MOOC structure to sustain the collaboration, dialogue (Hallissy, 2014) and ongoing reflection observed in earlier phases of the project.

Keywords

Teacher professional learning · 21st century skills · 4th wave · online learning · MOOCs

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Developing the Professional Development TEL Framework for FET - the story so far

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Abstract

Over a 2 year period, SOLAS the state organisation with responsibility for funding, planning and co-ordinating Further Education and Training (FET) in Ireland, in collaboration with the 16 Education & Training Boards (ETBs) and ETBI (Education and Training Boards Ireland) developed an evidence-based professional development strategy which is aimed at equipping FET staff in the ETBs to meet the skills development and active inclusion objectives for FET in Ireland.

The FET Professional Development strategy identified 7 priority areas for development with each area requiring an in-depth Development Needs Analysis (DNA) process to assess staff professional development needs and required professional development supports. Technology Enhanced Learning (TEL) was the first priority area to be developed.

TEL is a much-used term in education and training, yet it is often undefined in terms of what it looks like in practice (Bain, 2015) and is now a key action across Europe in all fields of education, particularly within FET. This paper outlines the process used in developing the *TEL Framework for FET* (SOLAS, 2016b) and will present the two current versions of the document. SOLAS, working with partners, harnessed the knowledge and expertise of the FET sector to create a framework that was underpinned by international best practice in TEL (i.e. DigComp, (European Commission, 2017; UNESCO, 2011)).

Keywords

Further education and Training · TEL Professional development · ICT competence

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The Micool Project: A shared perspective on deploying mobile technologies in European Schools

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Abstract

An increasing number of European countries have identified mobile computing devices, particularly Tablets as a focal point of their national strategies for education (Horizon Report, 2014). While a number of individual studies documenting tablet use have been conducted world-wide, most tablet school projects are conducted in isolation. Consequently the opportunity to share expertise and knowledge is underutilised. The Micool Project (mobile intercultural cooperative learning), a two year Erasmus+ Project (2015-2017) designed to advance the use of mobile technology in schools, is attempting to address this. Led by Ireland and involving 7 partners from 6 European Countries (Switzerland, Germany, Portugal, Montenegro and Poland), the partners have come together to share their expertise and learn from each other's experiences of using tablets in classrooms and to advance teachers' digital media competence. Based on feedback and research from teachers and students this presentation will demonstrate how the Micool Project and the resources produced have been utilised in various educational settings inspired by the principles of cooperative and intercultural learning. Similarities in terms of challenges encountered will also be presented and the benefits of coming together at a European level to share expertise and collaborating to produce classroom resources will be discussed.

Keywords

Mobile Technology · Music Curriculum · Constructivist App Design · Mixed Methods · Children

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Bridge21: a pragmatic approach to 21C teaching & learning

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Abstract

This symposium provides an overview of Bridge21 – a particular model of team-based, technology-mediated, 21C teaching & learning. First developed in the purpose-designed "Bridge21" experimental learning laboratory on the authors' university campus, this approach blends together several elements including teamwork, project-based learning, design thinking and a changed teacher's role. "Bridge21' is also the name of the overarching, design-based research project; through research, teacher training, and contributing to policy debates, the aim is to change the overall educational context in Ireland, providing a suitable framework for integrating technology and transforming teaching & learning in secondary schools.

The 3 papers in this symposium address some different aspects of the Bridge21 project. The first reports on the experiences of students attending workshops in the learning laboratory. It describes the impact on fostering students' 21C skills in the short term (immediately post workshop) and the long term (months and years afterwards). The second paper focuses on a multiple case-study investigation into the adaptation of the Bridge21 approach for teaching and learning second-level English curriculum content. The third paper discusses the approach being developed for the assessment of 21C skills in a school context. The presentations report positive results for both students and teachers.

Keywords

21C Teaching and Learning · secondary education· Bridge21 · 21C Skills ·

Effects of Performance Transparency in a Mathematics E-Learning Application: Evidence from a Randomized Controlled Trial

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Abstract

The diffusion of e-learning applications in primary schools is advancing fast. One key feature of e-learning applications is that they increase performance transparency, thus facilitating social comparison processes between pupils. Yet the impact of these processes on pupils is not well understood. The goal of this study is to gain insights into the effect of performance transparency in e-learning applications on pupil's motivation, learning outcomes, social behavior, and risk attitudes. We use a randomized controlled trial in elementary schools to compare mathematics e-learning systems that differ with regard to their performance transparency and find that performance transparency can increase student performance. Our results will help to develop guidelines for the development and usage of educational software in primary schools.

Keywords

RCT · computers · primary · performance transparency

Integrating a digital portfolio into Junior Cycle French: a case study from the Republic of Ireland

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Abstract

This presentation discusses the introduction of a digital portfolio tool, SeeSaw, (https://web.seesaw.me) into a post-primary French language classroom in the Republic of Ireland. This Action Research study was undertaken in order to examine the potential impact of this digital tool on a group of students during their first year of French language education. This study examines how the students exploited and interacted with Seesaw for specific written and oral language tasks and presents a number of considerations with regard to the optimum manner in which to integrate a digital portfolio. Furthermore, this presentation includes practical considerations with regard to implementing Seesaw as part of whole group classroom tasks and also its exploitation for creative and deeply personalised learning activities. The presentation also discusses the emergence of two distinct student roles during this process: namely "Content Creator" and "Content Curator" roles. Specific examples from the data wil highlight these personalised spaces inhabited by the students. Furthermore, this paper shall take into account the many challenges which currently exist for teachers and practitioners who wish to use technology in Irish classrooms. The paper concludes by providing a number of considerations with regard to developing an effective pedagogical approach when integrating a digital portfolio for language learning purposes.

Keywords

Digital portfolio ·ICT ·Post-Primary ·French ·Junior Cycle

ESOL in the Arena: Are technologies co-evolving with education and against it?

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Abstract

This study seeks to understand what influences an ESOL teacher's integration of ICT. Our research of teachers of English as a second or other language (ESOL) indicates that some can be frustrated with the increasing range of digital tools that are co-evolving with secondary schooling. The complexity of this co-evolution is presented with an analysis of one late career teacher set within Davis' [1] Arena framework for change with ICT in education to identify the digital tools that she selects to support learning and teaching in her class and related disruptions. This case study illustrates the challenges of late career teachers who choose to remain in the workforce part time. The research is set within New Zealand where ESOL is recognized as a priority for equitable inclusion alongside students who are engaged in study abroad. Digital tools both support and frustrate teaching and administration, particularly when supporting ESOL pupils who have beginner levels of English. The research indicates that change with ICT in schools is becoming more complex than previously recognised [2] and the generation gap between teacher and pupils [3] is only a minor aspect of this complex co-evolution.

Keywords

ESOL teaching · digital immigrant · secondary · bilingual ·

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Computer-based Working Memory Training in Primary Schools: Evidence from a Large-Scale Randomized Controlled Trial

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Abstract

Besides intelligence and subject-specific skills, other cognitive and noncognitive skills measured at childhood age substantially affect important individual life outcomes such as health, educational attainment, life satisfaction, and labor market outcomes. Working memory capacity is a key determinant for a wide range of these skills. We carried out a randomized controlled trial in primary schools to identify causal effects of a five-week computer-based working memory training. We find immediate and lasting gains in working memory capacity and long-term effects on certain school performance measures as well as on self-control.

Keywords

RCT · computers · primary · working memory

How to Implement Computing Education for All – Discussion of Alternative Organisational Models

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Abstract

The progressive imprinting of our life- and work environments by means of digitalisation and the resulting, challenges of personal, social and economic nature make it necessary for educational policy to respond to these challenges by further development of school education. Therefore, it is noteworthy that the choice of compulsory school subjects in most countries remained essentially unchanged since the time before digitalisation. Concerning digitalisation, often only electoral offers (optional subjects, working groups, etc.) are provided and it is thereby left to the self-responsibility of the pupils to ascertain themselves whether they would be interested or successful in this field. In view of the afore-mentioned challenges, it is necessary that all pupils become adequately computing-literate in order to also understand this part of the world surrounding them and to be prepared for active participation to an extend comparable to other subjects.

Concerning the implementation of computing education for all school students, different implementation models are proposed and discussed: integration of computer science concepts and competencies into existing school subjects [1], establishment of a separate computing subject [2], offers of workshops and projects in schools, and out-of-school activities. Within the context of this position paper, these implementation variants are discussed and evaluated.

Keywords

Computer education · organisation · integration · mandatory subject

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Creative Coding with Scratch: Presentation of the pilot project in primary school

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Abstract

This paper is about a pilot project held in an elementary school in Vienna, Austria. The project tries to combine something old and something new. Old is the wish to teach a programming language, new is the way to do so. The teaching model selected here takes a different path. It places the children at the center. Their needs can be dealt with individually in order to experience the development of program as a voluntary and amusing activity. But it is not only for the self-purpose, rather a tool to express themselves. The tasks created by the children lead automatically to the interest in problem solving itself and therefore to computational thinking. Which is experienced as an easy and on the go acquired competence and is getting a self-evident part of life from now.

Keywords

Compputional thinking · elementary school · framework conditions · implementation · first conclusion

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Student Retention: Towards defining measures for improved quality of teaching and learning in the first year of computer science studies

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Abstract

At the Faculty of Computer Science at the TU Wien, Vienna, Austria we identified in our efforts to improve the quality in the first year of computer science (CS) studies two challenges: first, the gender gap, as only 20% of beginners are women and even less (15%) graduate, and second, the high dropout rate of more than 50% which is predominant in the first year of CS studies [1]. In order to tackle these problems, the Faculty has set up a project called START Informatics which is aimed at analyzing the status quo for identifying potential pitfalls and to take actions and in order to develop measures to improve the quality of the first year of CS studies. Considering this, we will examine the current situation in teaching with a mixed methods approach comprising lecture observations, interviews and a large-scale questionnaire. As a result, we will develop measures to improve the first-year studies aimed at gender equality and a higher retention rate by introducing a didactical framework with tools for lecturers and a MOOC course on programming as bridge in the transitional phase between school and university to lower barriers for students without a technical pre-education and to address future female students.

Keywords

Student retention · gender gap · quality in teaching · didactics

References

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Relation of Reading Literacy and Frequency of Internet Use: Analysis based on PISA 2015

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Abstract

Reading literacy and competencies related to ICT-use are essential in the 21st century. Based on the database of PISA 2015, where reading literacy by default was assessed for the first time by use of computer-based assessments, this paper examines the relation of students' reading literacy and their time spent using the internet at school and outside of school. For this, a between-group comparison of selected European countries with high and low averages of students' reading literacy is conducted. We assume that in all selected countries the relation of using the internet and reading literacy is similar and reading online holds commensurable potential to foster reading literacy. Results reveal that reading literacy decreases with increasing time of using the internet at school per day. However, for using the internet outside of school a more frequent use of 30 minutes to four hours per day comes along with the highest reading literacy scale points in all countries. These findings indicate the potential reading activities on the internet outside of school hold for fostering students' reading literacy. The need for further analyses regarding the purpose and content of the reading activities as well as individual and school-related variables is addressed in the conclusions.

Keywords

Reading literacy · computer-based assessments · internet use at school · internet use outside of school PISA 2015

Book of Abstracts

Leading change to future-focused learning

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Abstract

Future-focused learning concerns the evolution of educational systems to ensure flexibility and ways meet the needs of the knowledge economy and harness the benefits of digital technologies for all learners [1]. According to the OECD and IFIP supported educational research, scaling up digital pedagogies in the classroom still remains a challenge for policy makers, leaders and practitioners [2, 3]. This symposium on future-focused learning will debate strategies through which different stakeholders in education can be supported to change their teaching and learning practices with the adoption of digital tools. Research evidence is drawn from projects and national initiatives the UK and New Zealand in early childhood, primary and secondary schools plus related professional development. Drawing on past, recent and current projects, the authors propose a range of support structures and approaches that can facilitate change. This builds on collaborative research undertaken on innovation and organizational change within IFIP symposia in 2016 and 2015 and also through thematic working groups at EDUsummITs in 2011, 2013 and 2015 including Davis' Arena of change with digital technologies in education [3, 4].

Keywords

Educational leadership · future focused learning · educational futures · innovative learning environment · professional development

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Smartwalk: Computer Science on the School Yard

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Abstract

Smartwalk is a playful enrichment activity for children on computer science. It takes place outside on the schoolyard. A class is divided into small "mission teams" of four persons. Each team gets a mission plan containing directions where to go and challenges that have to be solved at certain locations. These challenges include identifying physical objects using different formal and metaphorical descriptions, creating artefacts with found materials and specifying their locations, publishing poems by putting sticky notes at a wall. The basic idea is to do things that Generation Z-kids usually do with their mobile devices in a different (metaphorical) way just using the physical environment outside on the schoolyard. The goal is to make aware of computer science concepts adopted in smartphone apps and to promote the acquisition of computational thinking. Smartwalk was performed with 48 students (age 11 to 13) at a German secondary school in autumn 2016 with the help of students from a Pedagogy class (grade 13).

Keywords

Computational thinking · media education · outdoor activity· mobile device

Book of Abstracts

Involving Everyone: Coding and Decoding Languages

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Abstract

Through the use of humanoid robots, a rural school in South Australia has included both Aboriginal and non-Aboriginal people in embedding the "sleeping" language of the traditional owners of the land (the Narungga people) into the classroom. Aboriginal and non-Aboriginal students worked with virtual and real humanoid robots to develop in parallel both their programming skills and their understanding of the Narungga language and culture. This research is part of a larger three-year study investigating the impact of humanoid robots on students' learning and engagement and draws on questionnaires, interviews and journals from the educators. The study demonstrated how pride and interest in Aboriginal culture can be partially reclaimed using these inclusive and adaptive technologies. Simultaneously, students and educators were learning two languages; the coding language required to program the robot and the Narungga language.

Keywords

Programming · humanoid robots · Aboriginal students · language and culture

A Social Constructivist Approach to Computer Science Teacher Professional Development – the Bridge21 CPD Approach

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Abstract

Continuing Professional Development (CPD) programmes engage teachers in activities designed to deepen content knowledge and to enhance pedagogical strategies [1]. The recent push to provide short courses in Coding in Republic of Ireland post-primary schools [2] calls for specialized CPD to equip in-service teachers with computing knowledge and pedagogical strategies for teaching computing [3]. This paper reports on three years of research exploring what impact the Bridge21 social constructivist model of Computer Science (CS) CPD had on teachers self-reported preparedness for teaching programming at lower secondary level. The CPD was based on the Bridge21 pedagogical model which scaffolds teacher learning through facilitated, technology-mediated, project led, team work [4]. Acknowledging limitations with using social constructivist theory for teaching programming [5], this paper examines: (a) what are teachers' reactions to the Bridge21 CS CPD workshops; (b) what pedagogical content knowledge did teachers learn; and (c) what strategies did teachers intend using for teaching programming? Results indicate: (a) positive teacher reactions to the workshops; (b) teachers developed pedagogical content knowledge relevant for teaching programming; with teachers also reporting (c) strong intentions toward using the Bridge21 model, in particular facilitation, team work and contextualized learning tasks, as strategies for teaching programming on return to schools.

Keywords

Computer science · CPD · teaching programming · social constructivist learning

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Book of Abstracts

Algorithms and Programming: Spreadsheets, CAS, Flowcharts and Flowgorithm

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Abstract

How to teach algorithms and programming which are part of computational thinking [1] is still an open question [2]. Sleeman [3] described programming as the new Latin of the school syllabus. Although there are developments in ITC programming is still causing problems [4] perhaps because of the fact, that it includes knowledge of appropriate tools and languages, problem-solving skills and strategies for program design and implementation. The paper tries to answer the question – can basics of algorithms and programming at faculties other than computer sciences be taught more effectively using spreadsheets, computer algebra systems and particularly specialized flowchart software. Students nowadays are rather against algorithms and programming claiming that they do not want to be computer scientists. The first part of the paper gives a critical review of the literature of the subject. In the second part of the paper program of applied computer science course devoted to algorithms programming is presented. The third part shows results of two surveys based on surveys conducted by Konecki [5] in Croatia and by Malik and Coldwell-Neilson [6] in Oman. Final remarks are accompanied by repeating an open question raised four years ago – "how to motivate digital natives to learn" [7].

Keywords

Algorithms · programming · spreadsheets · CAS · flowcharts

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Basic Digital Education in Austria: One Step Further

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Abstract

Based on a nearly thirty years long history to implement digital education in Austrian primary and lower secondary schools, this paper deals with the current development and strategies to encounter this challenge.

After a literature review across national borders and some findings on different approaches in two different countries, a compressed historical view and exemplary empirical results from online-surveys describe the current Austrian situation. The year 2017 seems to herald the transition to accountability in form of a national curriculum for a new subject called "Basic Digital Education". Recently, a curriculum has been developed and will be piloted in some schools within one ministerial initiative called eEducation. This curriculum covers four years of lower secondary education and entails digital-, Informatics- and media competences. It consists of the topics Social Aspects of Media Change and Digitization, Information-, Data- and Media competence, Office Applications, Mediadesign, Digital Communication and Social Media, Security Issues, Technical Problem Solving and Computaional Thinking. It will be up to the schools to implement the curriculum of the new subject Basic Digital Education and/or within other existing subjects. A first important planning step is done, but the challenges for a success of "Basic Digital Education" for all lie ahead.

Keywords

Curriculum · Informatics · Digital Education · Digital Literacy · Media Competence

Computational Thinking in Primary Schools: Theory and Causal Models

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Abstract

During a three-year-project, teacher students (or student teachers) develop and pilot learning scenarios and materials in mathematics classrooms for third and fourth graders fostering 'Computational Thinking'. To evaluate these interventions regarding the impact on the teacher students as well as the schoolchildren causal models are used. These models based on program impact theory will be continuously refined to converge to a 'proof of the success' of the project.

Keywords

Computational Thinking in Primary Schools · Half-baked Microworlds · Evaluation Theory · Causal Models

Learning analytics and perceived self-efficacy:
Case study at Danish schools

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Abstract

This paper deals with learning analytics at public schools. It examines a research questions regarding the transformation of the teachers' role in relation to learning analytics and provides evidence suggesting a whole-school approach where affinity groups of teachers, systematically analyse and gauge their efforts in relation to student's performance. In addition, it presents a model to permanently implement learning analytics approaches into educational settings (here Danish schools) and proposes to focus in particular on self-efficacy of students as a parameter to be analysed together with their academic performance. The notion of self-efficacy refers to students' beliefs about their capabilities to solve given tasks and problems, and the paper provides evidence suggesting that perceived self-efficacy is is an indisputably important factor to analyse. In comparison with many other factors, it is the factor that correlates best with learning outcome of students.

Keywords

Learning analytics · 1:1 classrooms · perceived self-efficacy · formative feedback

Testing innovative ways of using digital technologies in schools to foster learning and teaching: The e-FRAN program

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Abstract

For years, digital technology has raised high expectations for improving educational outcomes [2]. In many schools worldwide, lessons using technology are part of the curriculum. Yet the reliable evidence on the effectiveness of technology on achievement is scarce [1]. Recent developments of increasingly sophisticated tools (e.g. virtual reality, adaptive learning) raise new hope and call for new research to identify the most effective ways of using technology. It is critical to empower teachers and school leaders by promoting the use of evidence to support teaching practice with technology.

Therefore the French ministry in charge of Education and Research launched "e-FRAN" in 2016, the first ever nationwide research & development program. This paper presents the selection process and the 22 projects [3] – out of 100+ applicants – that were granted €20M, to develop and test new digital tools and services for primary or secondary education. The overarching objective is to set up a new taskforce in a variety of research fields related to education (psychology, neuroscience, computer science, sociology). These large-scale projects require teachers and school leaders, research teams, local authorities, startups and non-profit organizations, to work together in a multi-stakeholder approach. Research evidence and effective tools will be promoted nationally and improve educational outcomes of all children.

Keywords

Digital technologies for Education · national strategy · multi-stakeholder approach · success criteria · French e-Fran program

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3D printing integration in the classroom: Overview of a project in the UAE primary schools

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Abstract

Although three-dimensional fabrication or 3D printing has been around for almost three decades, this technology is a new concept in education. However, due to recent availability of low-lost 3D printers and open access to 3D design software, 3D printing technology is making its way to education. The purpose of this paper is to present an overview of a two-year 3D printing research project implemented in four primary schools in the United Arab Emirates (UAE). The paper also discusses the training offered to teachers before the project implementation, and the results of a survey administrated to the teachers after the training. The 3D printing project is coordinated by a multidisciplinary research team and funded by the Abu Dhabi Educational Council (ADEC). It aims to support the integration of 3D printing in the Science, Math and English grade 5 subjects. The study participants consist of fifth grade teachers and their students from the participating schools. The research team expects to provide practical examples of 3D printing integration in primary schools to inform practice and the research community. The project is particularly significant to the UAE context as it supports the ADEC initiative to implement 3D in primary schools.

Keywords

3D printing · integration · primary school· 3D printers · training

Education in the Digital Networked World

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Abstract

The steadily advancing digitalisation of our world requires that the education system adequately prepares everybody for the resulting challenges. Different actors in the education system often see the solution either in digital media education [1], or computing education [2]. This position paper presents an integrated model – the so-called "Dagstuhl triangle", which was developed in collaboration of computer scientists, computing and media education researchers, teachers, and IT business and foundations representatives [3]. Comprehensively oriented education must take up an application-oriented, a social-cultural and a structural perspective on the phenomena, artefacts, systems and situations of the "digital world" encountered by students. The approach values existing views such as user training, media education and computing education and has the intention of integrating these views into a coherent overall concept. The teaching of computing competencies and digital media education are essentially complementary fields that can substantially benefit from each other. While computer science is concerned with teaching the underlying principles of the "digital world" and enabling learners to actively participate in the digital world, the goal of media education is to make learners competent and reflected users of existing IT systems.

Keywords

Computing education · media education · digital education · K12 · secondary education

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Digital safety and responsible use within a primary school ecosystems community in Aotearoa/ New Zealand

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Abstract

With the New Zealand Ministry of Education's emphasis upon e-learning in educational settings, and the correlating increase in approaches to learning with digital technologies in New Zealand primary schools, primary school-aged students in Aotearoa/New Zealand are increasingly using digital technologies in school settings at a progressively earlier age. As availability of digital devices outside of school also increases and the boundaries between usage blurs, there is an imperative to prepare students to use these technologies safely and responsibly across multiple contexts, and for multiple purposes. Implementing a school-wide, cross-sector, multi-stakeholder approach has been proposed as the most effective way to prepare young people in this area. However, little is known about how such an approach is actualized in primary school settings, and the benefits and challenges associated with its adoption. Drawing upon ecological systems theory, this interpretive case study will examine how one New Zealand primary school addresses digital safety and responsible use within the school ecosystems community, how they engage with individuals, groups or organizations situated within other ecosystem communities, and the drivers, enablers, barriers and tensions they experience within these endeavors.

Keywords

Education · digital technologies · digital safety · responsible use · ecosystems

Requirements for Mobile Learning in Vocational Training in the field of Mechanical Engineering

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Abstract

The dual system of vocational education and training (VET) in Germany takes place at vocational schools (30%) and training companies (70%) [2]. The focus of this article is on requirements for the integration of a mobile application into training companies operating in the sector of mechanical engineering. From the point of view of companies, the ratio of expenditure to benefits is too low for the internal development and use of specialist educational software [5]. Therefore, the purpose of the research project MLS is the development of a mobile application and integrated learning scenarios [7].

For this research, semi-structured interviews were conducted with nine trainers of five companies with mechanical engineering training facilities. We carried out a qualitative content analysis using the method of theme analysis [6]. A total of 2,096 codings were assigned by two persons and the initial category system was refined to a final set of 30 categories.

In accordance with results of interviews with apprentices [8], typical tasks begin with the analysis of mechanical drawings. Apprentices have to prepare a work plan for the production process, manufacture work pieces, and perform a quality control [1, 3, 4, 8]. The developed MLS application supports the organization of task assignments. MLS tasks are subdivided into reality-tested work phases.

Keywords

Vocational training · mechanical engineering · mobile learning · requirements analysis

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The acceptance of motion capture devices by the elderly

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Abstract

People are getting older, until higher ages, and we need to find solutions to keep the elderly active and healthy. Along with ageing, sedentarism promotes the appearance of cardiorespiratory diseases, diabetes, neurodegenerative diseases, bones and muscle weakness, increasing the aging process. Bearing this in mind, it is important to research new ways of ageing well, namely new ways of prevention. Therefor, the aim of this study is to research the acceptance, by the elderly, of activities using motion capture devices and to understand how they learn to use them, being conscious that, to keep elderly active, as a prevention, it is important to provide "technology which is easy to set up in order to relieve nursing staff and reduce access barriers" [1]; in addition, we will be assuming that playing exergames, or exercising through video games, gives the elderly a "possibility of encouraging seniors to remain active even when living in full-care environments" [1]. With this study we intend to contribute for the development of knowledge on elderly care and occupational therapy needs, in the context of developing elderly's quality of life through physical activity.

Keywords

Elderly ·Kinect ·Nintendo Wii ·Leap motion   motion capture devices

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Book of Abstracts

Measuring mobile phone dependence in Spanish and Greek high school students using a short scale: Validating both adaptations

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Abstract

Mobile phones appear to have become one of the main entertainment features in adolescents' life, which has also been suggested to be potentially addictive. A shortened version of a scale used to detect this potential addiction, the Mobile Phone Problematic Use Scale (MPPUS-10; Foerster, Roser, Schoeni, & Röösli, 2015) has been extracted from the Mobile Phone Problematic Use Scale for Adolescents (MPPUSA; Lopez-Fernandez, Honrubia-Serrano, & Freixa-Blanxart, 2012). To validate this shortened scale, a cross-national study surveyed 1391 high school students in both Spain and Greece, assessing both socio-demographic variables and self- perceived mobile use dependency. The MPPUS-10 exhibited good factorial validity, good reliability, and similar mid scores in both countries. Results from sub-scale symptomatology showed consistency in elevated levels of craving, withdrawal, and loss of control related to mobile phone use in both countries. This study presents evidence of self-perceived mobile phone dependence in south-European high school students, but more research is needed.

Keywords

mobile phone dependence · smartphone dependence · behavioural addiction · cross-cultural study · high school students

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Activation of Computer Science Teachers in Slovenia

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Abstract

The paper describes an approach of improving Slovenian Computer Science Education in general secondary school by forming an active and sustainable Computer Science Community of Practice. A project NAPOJ was born, in which three systems teachers use in teaching programming were aggregated: CS e-textbook, LMS Moodle and TOMO, an automatic assessment system for learning programming. 14 master teachers were selected, who prepared the initial set of in-class resources and materials at a 3.5 day national workshop. The workshop was followed by regional workshops throughout the Slovenia for other CS teachers and run by master teachers. Development of CoP was monitored and analyzed through various data gathering instruments, such as questionnaires, discussions, observation and Google Analytics. The preliminary results are highlighted in this contribution.

Keywords

Community of practice · programming · master teachers · teaching resources · general secondary school

Enhancing Learning in a Virtual Environment

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Abstract

Virtual learning is increasingly common due to factors, such as technological advances and globalization. Research presented in this paper is based on a virtual ICT for Development -course that was offered three times by a Finnish university. The course participants were from Finland, Germany, South Africa and Kenya. During the three course implementations, three different learning modes – traditional teacher-focused learning, team-work focused learning and a blend of the two – were utilized. Our research goal was to better to understand practices that enhance the learning process in a virtual environment. We collected data by three online questionnaires that were sent to the course participants by email after completing the course. In total, we received 61 responses. We discovered that the students' perceptions of the richness in qualities of learning were different in each course. This paper discusses this difference in line with the different learning modes used. These results encourage us to further research the link between learning modes and qualities of learning to 1) validate the findings with a larger sample, 2) compare them to previous studies in the field, and 3) to potentially propose generalizability of the findings.

Keywords

Virtual learning · virtual course · teacher-focused learning · team-work focused learning · qualities of learning

Augmented Reality as a Tool for Authentic Learning of Clinical Skills in Early Years of Medical Training

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Abstract

To ensure adequate skill competencies, many medical schools with large student cohorts have introduced clinical skills practice in the early years. However, the range of real life clinical signs that can be simulated on a standardised patient (SP) – actors is limited and the physical elicitation of clinical signs on actual patients by numerous novice students or on themselves as peers, may be discomforting or unsafe. Augmented reality (AR) has the affordance of presenting spatial 3D images superimposed on actual real life clinical environment unlike a fully virtual environment of virtual reality. Mobile learning through AR of real life clinical signs superimposed on specific areas of skin of normal actors can allow simultaneous authentic learning and multiple clinical skills practice and addresses the concerns of discomfort of clinical skills practice of actual patients by novice medical students. Instances of AR technology to aid authentic learning of clinical skills simulating actual 3D clinical signs (as an overlay) rendered from reference resources superimposed on the normal skin of SPs (as background), are discussed in light of these affordances. Alongside, our pilot work on developing an AR application - Clinical Augmented Reality Objects in Physical Examination (CAROPE), for the simulation of gastrointestinal signs on a normal SP is illustrated briefly.

Keywords

Augmented reality · early years · medical education · clinical skills · authentic learning

Book of Abstracts

Understanding the best way to embed ICT in teacher education

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Abstract

Every Australian school teacher is required to include instruction in information and communication technology (ICT) in their teaching. Thus, information and communication technologies in education (ICTE), including technological, pedagogical and content knowledge (TPACK), needs to be taught to every pre-service teacher (PST). A drop in the digital competence of high school students suggests many PSTs are not reaching the levels of ICTE competence envisaged to deliver the Australian Curriculum. Universities are grappling with the most effective way to achieve this. This paper focuses on the effectiveness of embedding ICTE in education units in two different ways. Qualitative data was collected from PSTs from units in which ICTE was actively embedded: in one, ICTE was embedded as a content delivery tool only; in the other, PSTs were additionally required to create a digital learning object as part of the assessment task employing experiential learning. Findings indicate that when PSTs are required to create using digital technologies they gain a deeper understanding of TPACK and have greater intention to use ICTE in their future classrooms.

Keywords

Computers and Society · Initial teacher education · Information and Communication Technology · Experiential learning

MusicKit: Developing a Tablet Based Explorative Learning Tool to support the Music Curriculum in Early Primary Education in Ireland

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Abstract

The rise of touchscreen technology like tablets opens up opportunities to enhance classroom learning. The ability to touch and interact with content on screen seems particularly suited to younger learners with Guernsey (2012) arguing that children should be encouraged to explore and create at their own pace because children learn best when they are fully engaged and feel in control. There are not many apps built with this approach in mind leading Goodwin (2012) to call for the development of more constructivist apps to facilitate open-ended discovery and exploration.

This presentation will discuss findings from an ongoing classroom based research project examining the development and application of a tablet based explorative tool, "MusicKit", to support music learning in Irish primary schools. Alongside demonstrating the apps features, this presentation will show how feedback from pupils who have used "MusicKit" indicate it is suitable for children of all music backgrounds to enable them to engage actively in "Listening, Performing and Composing" without any pre-requisites - using objects they are already familiar with [block building]. Early research data indicates that "MusicKit" can help to fulfil the aims of the music curriculum and facilitate music learning and explorations using tablets in education.

Keywords

Mobile Technology · Music Curriculum · Constructivist App Design · Mixed Methods · Children

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WCCE 2017 Symposium Submission: Initiatives to Promote and Develop Students' Computing Skills

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Symposium Introduction:

Computing and related concepts such as computational thinking or coding are now generally regarded as key skills for personal and professional development. Increasingly both within Europe[1] and beyond, computing in schools and in universities is being promoted as a policy priority in order to ensure that students are developing crucial skills for life, for example critical thinking, as well as skills for work, for example coding. There is widespread acknowledgement that problem solving and critical thinking skills are beneficial transversally for all students[2]. Moving beyond their application in the context of computer science, problem solving and critical thinking are fundamentally important in a range of educational disciplines and activities. Outside education, coding and more specific technical skills are directly and indirectly supportive of career and vocational development. It is increasingly recognised, for example, that, driven by industry demand, complex problem solving skills will become more and more important in the 21st century[3]

Specific initiatives in schools and universities are attempting to deliver on the policy goal of developing skills relating to computing. There is considerable variation between education systems. For example, in some countries, computing is an established part of the school curriculum; however in many countries the promotion of the computing takes place using initiatives outside the formal curriculum. Consideration of a range of these initiatives allows for sharing of best practice as well as for the identification of the common characteristics. This symposium provides a platform for a range of these initiatives to be examined in the context of (a) their top-level objectives, (b) their specific target audience, (b) the focus of their content, and (c) their deployment, promotion, and impact. The contributions also emphasise recommendations for effective interventions based on this range of European experiences.

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[1] European Commission, 2016 "A New Skills Agenda for Europe", COM(2016) 381 Final
[2] Pp. 60 European Schoolnet, 2016 "The E-Skills Manifesto"
[3] Pp.20-21 World Economic Forum, 2016 "The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution".

An Active-Learning Approach to Problem-Solving for ICT Students

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Abstract

The inquiry-based learning framework reckons on an inductive approach where remarks, investigations and reflections made by students constitute the base elements. Students should be actively involved by significant questions from scientific and technological standpoints; they should give importance to evidences through which develop and evaluate explanations addressing those questions; students should also formulate descriptions from evidences, communicate and justify proposals.

The purpose of this study is to understand how an active learning framework impacts on the outcomes of undergraduate courses. A case study involving a course is reported.

The specific context is a course on Information Systems and Product Development at Turin Polytechnic; the proposed approach is an experiential environment, like a living lab, where different actors participate in co-creating and appraising innovative ideas, accompanied by technological prototypes.

This 13-week course is based on the inverted class model, and on direct involvement of enterprises, which participate specifically to the problem definition and assessment phases. In the case study shown, students simulate a production business unit in all the phases that characterize the product/service development life cycle. In such a context, the target competences are those required by ICT professionals, considering current trends in that domain; similar courses could benefit from this approach.

Keywords

Information systems · problem solving · inverted classroom · university education · ICT

Developing and improving ICT skills in Lithuania

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Abstract

Currently ICT are everywhere, and today ICT knowledge and skills are required in various areas. However, surveys show that many people do not have enough ICT skills. Worldwide surveys also show that people tend to overestimate their digital skills. People who have access to digital technologies and the internet do not automatically develop the digital skills that they need for personal or professional life.

The effective use of technology is vital for economic growth, productivity and innovation; furthermore, in the near future almost all workplaces will require at least basic digital skills. It is important to train all users of computers and smart devices to be encouraged to develop ICT skills needed for jobs, to gain safe internet and e-services usage knowledge and skills as well. Especially it is important for young people, parents and teachers.

All European countries face similar problems related with the lack of digital skills. Therefore there are launched initiatives helping to develop ICT skills for European citizens.

This presentation contains good practice examples and initiatives supporting ICT education in Lithuania including the National Digital Coalition as well as various IT programmes for schools.

Keywords

Digital skills · ICT education · school programmes

"Class with ECDL" Programme in Poland

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Abstract

A new Computer Science curriculum was set by the Ministry of Education in Poland in 2017. The number of teaching hours was unchanged and on the other hand the scope was extended, in particular by Computational Thinking. Such school subject is of course very important, especially if it is taught beside ICT and not instead of it. Nowadays it is crucial for Polish schools to teach ICT in a very effective way, giving space for Computational Thinking in the whole Computer Science curriculum.

Polish Information Processing Society (PIPS) introduced the "Class with ECDL" Programme to help teachers to teach and students to learn ICT in a very effective way. The Programme is devoted for students aged between 11 and 18 years. It is free of charge for schools. Teachers get help from PIPS in methodology of teaching as well as in integrating of ICT curriculum with ECDL syllabi. They get free access to the "Class with ECDL" exercise e-book. They can collaborate with other "Classes with ECDL". Students – if they wish to do so – can take ECDL tests with 10% discount off the reduced, student's price. The new curriculum covers most of 8 ECDL modules syllabi.

Keywords

Computational thinking · curriculum · teachers supports

Book of Abstracts

Keywords Integrating Computational Thinking in Compulsory Education in Europe: Research findings and policy implications

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Abstract

In the past decade, Computational Thinking (CT)[1] and related concepts (e.g. coding, programing, algorithmic thinking) have received increasing attention in the educational field. This has given rise to a large amount of academic and grey literature and numerous public and private implementation initiatives. Despite this widespread interest, successful CT integration in compulsory education still faces unresolved issues and challenges. Computational Thinking Study (CompuThink)[2] provides a comprehensive overview of CT skills for schoolchildren, encompassing recent research findings and initiatives at grassroots and policy levels. It also offers a better understanding of the core concepts and attributes of CT and its potential for compulsory education. The study adopts a mostly qualitative approach that comprises extensive desk research (570 publications, 7 grassroots, 5 MOOCs and 3 national curricula analysed), a survey of Ministries of Education and 14 semi-structured interviews. CompuThink provides a comprehensive synthesis of evidence about the introduction of CT in compulsory education in Europe, including a set of policy recommendations, organized in four areas: developing a shared understanding of CT and the relationship with 21st century skills; integrating CT across all levels of compulsory education; adopting a holistic approach for introducing CT in compulsory education; fostering broad engagement and optimizing impact.

Keywords

Computational thinking · programming · coding · compulsory education · policy implications

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Computing and Technology Initiatives for Schools: Spotlight on Ireland

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Abstract

This presentation puts the spotlight on Ireland and explores popular initiatives that expose students to computing and promote technology, outside of the formal curriculum.

The ICS Foundation, (the social enterprise division of the Irish Computer Society) has developed two programmes to support teachers who drive reform and innovation in an informal way.

Cliste is an integrated syllabus for primary schools that enables teachers to teach the fundamentals of ICT, coding, digital media and digital citizenship as part of the prescribed curriculum.

At lower secondary school level, the ICS Foundation developed a modular computing programme designed to be delivered as a short course of study.

Other engagement strategies to be explored include national coding and computational thinking competitions that facilitate student involvement in and out of school settings and an annual technology festival that engages young people and provides a focus for professional bodies, non-governmental organisations and industry to play a supporting role.

These initiatives, experiences and recommendations for effective interventions will be discussed within the context of the Irish education landscape where increased calls for the teaching of 'computing' in schools has led to the proposed development of a Computer Science subject at higher secondary school level by 2019.

Keywords

Schools · Curriculum · Technology · Computing · Teachers

Optimising the use of Learning Technologies in Science Education: a Graduate School of Education Approach

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Introduction

These four papers present an approach to comprehensively embedding learning technologies in a graduate school. Learning technologies will be shown to have been purposefully and progressively implemented, tracked and reviewed. The experiences were designed, and anticipated, to support our future pre-service teachers (PSTs) of science, and later to inform their practices in classrooms.

This symposium reports on four digital offerings that can be viewed as significant parts of an orchestrated whole. It is demonstrative of the principles that are underpinning the re-generation of uses of learning technologies (LTs), at every level of program delivery, in the Melbourne Graduate School of Education. These papers focus on differing aspects of the experiences provided in science education. These experiences are meant to be indicative of the thoughtfully crafted flow that is occurring between a set of interwoven domains of experiences. The experiences designed for pre-service teachers, are to be encountered, sequentially, throughout one year, and within three science education subjects, in a post-graduate teacher education degree.

The first symposium paper reports on a program of support developed for academics using LTs in their science education program, with a view to developing a supportive model. The second paper explains ways PSTs use learning technologies for their immediate learning needs in science education, and linked to the assessment of their subject requirement needs. The third paper reviews PSTs use of a diverse range of LTs to create and support effective communities of learners, providing a critique of improvements for the future. The fourth paper reports on research of LTs as enablers of science learning, for school pupils, and indicates how, when supported by the more able peer, pupils can demonstrate that they make substantive growth in their understandings.

Embedding Digital Learning Products into a sequence of Science Learning for Pre-Service Teachers

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Abstract

This paper reports on learning experiences developed for pre-service teachers (PSTs), in a Masters Level science education subject. This work is informed by specific pedagogical literature in response to pervasive concerns in science education. One premise is that authentic real world experiences engage and empower science learners. PSTs undertake learning experiences configured to result in production of narratives. Learners curate images and videos, as data, of import to them, connected to meaningful bodies of science knowledge. PSTs can collaborate to develop stories, resulting in learning products that communicate educative science messages. These learning experiences further PSTs understandings of science concepts, develop capacities to utilise, and understand the value of real world types of experiences.

These experiences contribute to a range of PSTs capabilities. Science process skills are utilised, including observing, comparing and contrasting, recording and creating data sets. PSTs have a need to purposefully, and authentically, draw on key science concepts. There are opportunities for both science knowledge and skills to be refined, through reiterative processes enabled by a sequence of digital learning experiences. Positioning theory provided the informing theoretical framework to develop this learning experience structure.

Tytler [1] described a lack of interest in science education from pupils that was of concern internationally. There have been historic calls, to science educators, to ensure there is a clear connection between the in-class topic of science and the students' experience of the world [2] evident in Smith's work from 1988. Sjoberg [3] adds that there is a need for science itself to be understood in the work of scientists, in the way the body of knowledge grows, as well as its role in the lives of everyday people.

There are frequent calls for pupils, as learners of science, to be willing to ponder and wonder about the world around them. There is a call to create the 'spark of excitement' [1] that arises when students have made sense of their world through their discoveries. This has been recommended for some time and seems to have remained difficult to consistently secure in classrooms.

Keywords

Digital Learning Products · Science Education · Pre-service teachers

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Shaping the Future: developing a model for increased digital proficiency in teacher educators

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Abstract

This paper explores an ongoing research project at an Australian graduate school of education. The research sought to develop the digital capabilities of teacher educators as they work to prepare teacher candidates (TCs) for their professional teaching role in schools.

The graduate school of education at this institution has sought to develop the skills, both pedagogical and technical, of its academic teaching staff to meet the needs of their TCs. This research sought to support increased, diverse and sustained use of digital technologies in one education faculty. A model of academic support was trialed and explored for its impact on academics' willingness to integrate DTs. The model was developed from investigation into relevant literature [1, 2]. This model continues to evolve through ongoing analysis throughout the project and currently comprises: structured as well as on-demand support from the Digital Learning Leader (DLL); one-to-one support meeting; at-desk support; co-teaching in class; modelled teaching in-class; individual goal setting with the DLL; written reflections submitted on progress and further needs; formal (planned meetings) and informal (coffee-shop conversations) peer-support; provision of resources, literature and lesson planning ideas matched to each person's learning goal.

This qualitative research has provided insight into the types of support and interactions that are perceived to have benefitted the learning of digital and pedagogical skills. Academics felt that they benefitted from a combination of personal, group and teaching support, both from the DLL and from their peers.

There appears to be a need to focus on 'sharing your learning'[3] and 'one to one learning' aspects of the proposed model. Support may need to include an iterative component that offers ongoing support throughout the learning. Ongoing, iterative support for participants may provide a digital-learning support structure that could aid academics to maintain currency in the every-changing landscape of digital technology. This may include regular meeting times, peer mentoring structures or online training developed to meet emerging needs.

Keywords

Tertiary education · technology · learning · initial teacher education · digital pedagogies

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Mobile Technologies Supporting Professional Learning Communities within Professional Development of Pre-Service Teacher STEM Education

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Abstract

Over a three-year period, academics from the Melbourne Graduate School of Education, The University of Melbourne, have partnered with a range of academics. These include staff from the Faculty of Science (The University of Melbourne), the Victorian Space Science Education Centre (VSSEC) and the Gene Technology Access Centre (GTAC) to facilitate an elective subject for pre-service teachers (PSTs). Together we have sought to develop and strengthen their teaching in the area of STEM (Science, Technology, Engineering and Mathematics) education.

Students in this subject were supported to develop 21st Century skills that enabled them to work effectively in Professional Learning Communities (PLCs). Pre-service teachers observed and responded to each other's teaching providing real time feedback using 'Padlet' (a readily available web based application). Following each lesson students used the resultant 'Padlet' data as a prompt to promote reflective discussion. We analyse excerpts of Pre-service teacher responses to an online survey as a means to gain some understanding of their perception of working in this way. Additionally, Padlet, feedback was thematically analysed in an effort to understand how teacher candidates focussed their feedback and limitations of this approach to facilitating professional development. Through adoption of this tool, critical collaborative reflection was fostered.

Keywords

STEM · Professional Learning Communities · Mobile Technologies · Teacher Education

How Interactives can change *learnability* of science concepts for young children – re-positioning them as learners 'who can and did'

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Abstract

Research into ICT influences on learning science mainly focuses on secondary and tertiary levels. Our research explores what younger children can and will 'say and do' when positively positioned [1] to think with scientific concepts.

The progress in meaning-making of three young children (6, 9 and 12yo), while playing a molecule building interactive game, is tracked. How they were positively positioning and what this afforded [2] in their conceptual work are discussed. Positioning theory [3] analysis highlights the scientific sophistication of their progress. What each young child could do [4] with the three levels of thinking of chemistry (macro/sub-micro/symbolic) changed 'in the doing'. The chemical thinking storylines that emerged demonstrate that exploring molecules and chemical symbols was engaging for the participants.

Many scientifically sophisticated questions were raised when 'playing', with the game design directing attention to meaning-making opportunities. This examination provides insights into how well designed interactives can be employed to offer, direct and help structure early 'knowing of' big scientific concepts as thinking tools [5]. Implications for structuring early learning opportunities of concepts with ICT are proposed [6]. Well designed ICT interactive games engage and (re-)positioning young learners with scientific thinking, directing meaning-making beyond the current norms of 'expectations'.

Keywords

interactives · early learning · positive positioning · science concepts

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Health-game development in university – lower secondary school collaboration

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Abstract

This paper describes and analyses a case of multidimensional serious game development collaboration. The parties included Metropolia University of Applied Sciences from Finland, Tokushima University from Japan, and a lower secondary school in Helsinki. The development team involved students from three different departments of the Finnish university, both Finnish and immigrant students. The two-year project produced two successive prototypes of the game, which contained a large amount of material about adolescent health issues. School pupils tested the game several times and commented on its features. Finnish pupils who were used to high quality commercial games expressed critical comments to the design and visual properties, even though they were positive to the idea of learning health facts in an entertaining way. The internationalization of the game has not been completed yet. The results indicate that even though the coordination of such a project with many parties involved is challenging, the actual designing the real content and functionalities of a serious game pose more challenges. Effective preparation in advance and research on educational game designs and aims will be needed in the following phases of the work.

Keywords

e-health · health education · serious games · co-development

Book of Abstracts

Konnecting: a mobile game to introduce freshmen to the evolution of communication

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Abstract

Due to the wide use of mobile devices by undergraduate students' and their interest in playing digital games, we developed a serious game to motivate them to the subject of communication. Previously, we conducted a study about game preferences and habits of Portuguese university students. We collected data from 626 students which is briefly presented in this paper. The serious game about the evolution of human communication was designed and developed taking into consideration the results of the study. The game *Konnecting* was included in the course materials for first year undergraduate students and the paper presents their reactions and opinions about it as well as learning results. The results achieved from pretest to the posttest were statistically significant. Students reported enjoying the game and they felt engaged in the tasks.

Keywords

Mobile game · Konnecting · undergraduate students · game preferences · learning

Game-play: Effects of online gamified and game-based learning on dispositions, abilities and behaviours of primary learners

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Abstract

This meta-level review of the literature set-out to examine the impacts of game-based/ gamified learning on dispositions, cognitive abilities and behaviours of learners aged 6-12, and to identify the factors that contributed to these impacts. A total of seventeen relevant studies were identified that had been implemented across a range of disciplinary areas in the period under review (2005-2015). The results indicate that online gamified/ games-based learning has been shown to increase the level of academic performance of learners, and improve cognitive competencies in problem-solving, multiplicative reasoning ability, self-efficacy and critical thinking. Learners' intrinsic motivation has been shown to have been enhanced through motivational factors (confidence, satisfaction and enjoyment) promoted within the online game design, and this had a direct effect on increasing engagement and improving academic achievement.

Keywords

Gamification . Gamified Learning . Primary Education .

For ARGument's Sake! The pros and cons of Alternate Reality Gaming in Higher Education

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Abstract

This paper explores the potential of Alternate Reality Games, a type of Game-Based Learning experience, within higher education. The discourse opens by explaining the essence of ARGs and listing a number of serious ARGs that have been created within the last decade. The paper, then, moves to present the findings from the main ARG research studies that have been deployed at tertiary level, which trigger a discussion on the evident strengths and weaknesses of the game when it is utilized in higher education.

Keywords

Alternate Reality Games· Higher Education· Game-Based Learning

eExams: Strength in diversity

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Abstract

This study examined the growing number of emerging eExam [1] systems that allow students to demonstrate academic achievement using computers in schools and universities. Using a mixed-methods case study approach, the research gathered data from a desk audit, followed by observations and interviews in selected countries. The data was thematically investigated for commonalities and differences in the eExam systems. The findings show the main systems under development can be divided into two different groups. The first are alternative booting systems which make an entire, identical operating system and application suite available to each candidate. The second comprises a variety of secure web-browser solutions. Both approaches permit the use of software applications, but it is not clear whether this affordance is used to transform curricula. It is clear there is tension [2] between administrative convenience which saves staff time, and the transformational potential of computers in education which would alter what is learned as well as how it is learned [3]. This tension is epitomized by the different proportions of undergraduate examinations conducted using computers, ranging from 1% to 40% in some institutions. It was also clear from the interview data that the intentions of some countries and institutions are to raise this to 100% in a five year span or less.

Keywords

eExam system · administrative convenience · pedagogical affordances · software applications

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Technology and Formative Assessment: Affordances and Considerations

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Abstract

Assessment is a key part of the teaching and learning process. It enables teachers and students to monitor progress and can facilitate improved instruction. There are three main types of assessment: assessment of learning, assessment for learning and assessment as learning. Each type of assessment has a role to play in the teaching and learning process. This paper focuses on the use of technology in formative assessment or assessment for learning. Formative assessment can provide timely, specific feedback to students [1] and it can provide insights into what learning is taking place [2]. [3] outline seven principles of good feedback practice and many of these can be facilitated by the use of technology. For example, online quizzes can facilitate self-assessment by learners and enable them to monitor their own progress. Technology can help to deliver high-quality feedback information to learners, so they get immediate feedback on areas of misunderstanding. In-class, real-time quizzes can inform teachers of their students' learning, students of their own learning and in relation to other students. Technology makes it increasingly easy to carry out formative assessment and this paper shows examples of how this can be done.

Keywords

Technology · formative assessment · education · affordances · considerations

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Use of WhatsApp Closed Group as Learning Tool for Group Assessment in Higher Education

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Abstract

WhatsApp application usage among students and teaching staff at the university level is increasing in Malaysia as well as at Sunway University Malaysia. Although students and teachers use WhatsApp application to communicate but, it would be ideal to see the use of this application for students to interact with group members in order to meet virtually to discuss and complete the assessment from the beginning of the semester. This study aims to identify whether this application will be an effective channel that can bridge a relationship between student and educator in order to share ideas, opinions and feedback for group assessments compare to face-to-face discussion. The data is collected from students who have registered for Media Relations and Public Relations module consisting of 16 students. Results showed that majority of students are able to participate, contribute ideas towards their group assessment from the beginning of the semester. The students were easily connected with their members to brainstorm, generate ideas, delegate task, and discuss about the group assessment which give them more space to complete the assessment and created a platform for educator to observe and monitor the progress of student's assessment.

Keywords

WhatsApp. Group Assessment. Group interaction.

Designing Assessment For Blended Learning Scenarios: A Decision Support Tool

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Abstract

This paper examines the process of designing assessment and how teachers in higher education, who are developing blended learning materials, can be supported to consider their approach to assessment and to select from the range of assessment opportunities that are becoming available. The paper presents the design and evaluation of a decision support tool for assessment design, which was developed on a collaborative project across Indian and European universities. The tool was designed based on a shared framework of design and assessment principles which took account of the purpose of the assessment, knowledge and skills to be assessed and how and by whom the assessment was to be conducted. The tool was not intended to provide definitive advice but rather to support the decision-making process and professional development of teachers. This support would be provided during the use of the tool and as a summary at the end of the teacher's consultation with the tool.

Overall, users were satisfied with the tool, as the data show, and were positive about using it in designing assessment. Recommendations, that were made during the evaluation, for redeveloping the tool to make it more suitable for a wider audience are discussed.

Keywords

assessment design · online learning · blended learning · assessment

How Can We Make Computing Lessons More Inclusive?

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Abstract

Whilst there is a substantial body of research that shows how Information and Communications Technologies (ICTs) can support schools and teachers to make their classrooms more inclusive, there is a need for more evidence describing how best to ensure that the teaching of computing itself is inclusive. This paper reports on a literature review of inclusive education in school computing lessons. It identifies a number of inclusive practices, including ensuring a relevant and authentic curriculum that focuses on depth of understanding, promoting culturally relevant tasks, and ensuring an inclusive environment that challenges bias. The review also identifies a need for much more research into what constitutes an inclusive computing classroom.

Keywords

Schools · Computing · Computer Science Education · Inclusion · Pedagogy

Constructive Interaction on Collaborative Programming: Case Study for Grade 6 Students Group

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Abstract

Recent learning sciences have revealed some of the mechanisms of how people learn through interactions in collaborative educational settings. In this research, we tried to capture the nature of constructive interaction by in-depth qualitative analysis of a discourse in a programming learning environment. The analyzed group was comprised of three female students, all in the sixth grade, who engaged in making an animation using Scratch. However, they had trouble with their object modeling during the task. Through their problem-solving procedure the students attempted externalizations of their solution ideas, and that interactions promoted their understanding of the problem through the iterative process in each individual. Working collaboratively, the three students used varies procedures to solve their shared object-modeling problems.

Keywords

collaborative learning · programming · computational thinking · K-12 · constructive interaction

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Changing rationales for computers in education: from liberation to involvement

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Abstract

This paper examines the themes for two World Conferences on Computers in Education to characterize the shift in rationale from 'liberating the learner' (the 1995 theme) to 'involving everyone' (the 2017 theme). The 1995 contributors' responses to the theme of liberation are analyzed in terms of how the affordances of digital technology for learning are orchestrated by teachers, students and the technology itself. The effect of developments in the use of technology in education since 1995 are considered using four key examples. The paper concludes that the shift to 'involvement' represents a progression in expectations concerning how technology can aid learning, but that 'involvement' demands an intention to learn and an ability to orchestrate resources from the learner which teachers should help them to acquire.

Keywords

Learning environment · liberation · affordance · orchestration · involvement

Effects of Learning with Educational Robotics on Third-Grade Students' Computational Thinking Skills

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Abstract

The paper addresses the issue of how computational thinking can be taught to young children with the use of educational robotics using the kit LEGO WeDo. Due to the young age of the students who participated in the study, computational thinking was measured in terms of four sub-skills, namely, sequencing, correspondence between actions and instructions, debugging, and flow of control. Students were assigned to an experimental group and a control group. The results of the study showed that educational robotics was an effective method for teaching computational thinking skills to elementary school students. According to the findings, students in the experimental group outperformed the students in the control group. These findings showed that, despite the short duration of the intervention, engaging children in computer programming activities with robots helped them to develop computational thinking skills.

Keywords

Computational thinking˙ robotics˙ primary education

Maximizing the teaching and learning potential of adult learners: Applying and using a guided hybrid learning approach

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Abstract

Adult learners are different from traditional students, and as such require a different approach to help support their academic success, ability to learn, and to maximize their potential in terms of their education. Traditional approaches may be less suitable to students who have differing life experiences, professional work expertise, and incomplete or interrupted educational backgrounds. This paper looks at adult learners and their characteristics, followed by an examination of various teaching methods and approaches which can be employed to meet the specific needs of adult learner students. The result is a modular course design which has been, and can be used in various ways, to enable a high level of meaningful learning, satisfaction, and student retention for adult learners.

Keywords

adult learners · constructivism · hybrid distance learning · collaboration · andragogy

Notes