

IFIP TC3 Joint Conference
Stakeholders and Information
Technology in Education
6th to 8th July 2016 - Guimarães, Portugal



SaITE 2016
IFIP TC3 Joint Conference
Stakeholders and Information Technology
in Education
Programme and Book of Abstracts

Torsten Brinda (Lead editor)
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Universidade do Minho



Universidade do Minho
Escola de Engenharia



Universidade do Minho
Instituto de Educação



MUNICÍPIO DE
GUIMARÃES

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IFIP TC3 SAITE 2016 - PROGRAMME¹

Overview of the Programme

Registration is open from 15:00 to 18:00 on Tuesday 5th July 2016 in Room: Hall (Building 02; Hall do Auditório Nobre).

The overview table following shows times and locations for registration on the other days of the conference.

The tables on the following pages show times of sessions during the conference.

In the tables following, the letters refer to the following room locations:

A – Building 02; Anfiteatro B1.16

B – Building 02; Anfiteatro B1.17

C – Building 11; 1st floor; Auditório, Departamento de Sistemas de Informação

D - Building 11; 1st floor; Sala de Reuniões 1, Departamento de Sistemas de Informação

5 th July 2016		
15:00 ✓	Registration open	
18:00	Room: Hall (Building 02; Hall do Auditório Nobre)	
6 th July 2016		
08:00	Registration open Room: Hall (Building 02; Hall do Auditório Nobre)	
09:00 ✓	Conference Opening Ceremony <i>TC3 chair – Sindre Rosvik</i> <i>IPC co-chairs – Don Passey and Cathy Lewin</i> <i>LOC chair – João Álvaro Carvalho</i> <i>Mayor of the City of Guimarães – Dr. Domingos Bragança</i> <i>Dean of the Engineering School – Professor João Monteiro</i> <i>Dean of the Education Institute – Professor José Augusto Pacheco</i> <i>Rector of the University of Minho – Professor António Cunha</i> Room: A	
09:30	Keynote Address 1 <i>Onlife Learning and the Changed Roles of the Stakeholders</i> <i>Professor Emeritus António Dias Figueiredo, University of Coimbra, Portugal</i> <i>Chair: Ana Amélia Carvalho</i> Room: A	
10:30	Coffee break	
11:00	Paper Session <i>Learning and Teacher Stakeholders</i> <i>Chair: Torsten Brinda</i> Room: A	Paper Session <i>Stakeholders and IT Management</i> <i>Chair: Javier Osorio</i> Room: B
12:15	Lunch	
13:15	Paper Session <i>Stakeholders and Computer Studies</i> <i>Chair: Eric Sanchez</i> Room: A	Symposium <i>The Making of a Science Teacher</i> <i>Chair: Don Passey</i> Room: B ²
14:45	Coffee break	

¹ This version of the programme is subject to changes.

² In this session two papers will be presented by Skype and video link.

6 th July 2016		
15:15	Paper Session <i>Vocational and Professional Concerns</i> <i>Chair: Peter Micheuz</i> Room: A	Paper Session <i>Stakeholders and Pedagogies</i> <i>Chair: Cathy Lewin</i> Room: B ³
16:45	Break	
17:00	Symposium: <i>The Role of Educators in Preparing ICT Professionals</i> <i>Chair: Moira de Roche</i> Room: A	System Presentations <i>Chair: Maciej Syslo</i> Room: B
17:45	Break	
18:00	WG3.1 and WG3.4 AGM Meetings Room: C and D	
19:30	Reception	
7 th July 2016		
08:00	Registration open Room: Hall (Building 02; Hall do Auditório Nobre)	
09:30	Keynote Address 2 <i>Could Smart Partnerships Level the Playing Field in the Arena of Change with ICT in Education?</i> <i>Professor Niki Davis, University of Canterbury, New Zealand</i> <i>Chair: Cathy Lewin</i> Room: A ⁴	
10:30	Coffee break	
11:00	Symposium <i>Stakeholders of Education in ICT4D</i> <i>Chair: Mikko Ruohonen</i> Room: A ⁵	Symposium <i>Roles of CS/ Informatics in the Curriculum – Why, What, How?</i> <i>Chair: Mary Webb</i> Room: B
12:15	Lunch	
13:15	Keynote Address 3 <i>The Role of EMIS in Strengthening Education Systems</i> <i>Dr Husein Abdul-Hamid, World Bank</i> <i>Chair: Don Passey</i> Room: A ⁶	
14:45	Coffee break	
15:15	Symposium <i>Stakeholders of Education in ICT4D</i> <i>Chair: Mikko Ruohonen</i> Room: A ⁷	Symposium: <i>Smart Partnerships in Education: What are they and what do they look like?</i> <i>Chair: Cathy Lewin</i> Room: B
16:45	Break	
17:00	Paper Session <i>Stakeholders and Learning</i> <i>Chair: TBC</i> Room: A	Symposium: <i>Roles of CS/ Informatics in the Curriculum – Why, What, How?</i> <i>Chair: Mary Webb</i> Room: B

³ In this session one paper will be presented by Skype and video link.

⁴ There will be additional attendance in this session by directors of schools of the municipality.

⁵ This session will be video-recorded for later use by the chair.

⁶ There will be additional attendance in this session by directors of schools of the municipality.

⁷ This session will be video-recorded for later use by the chair.

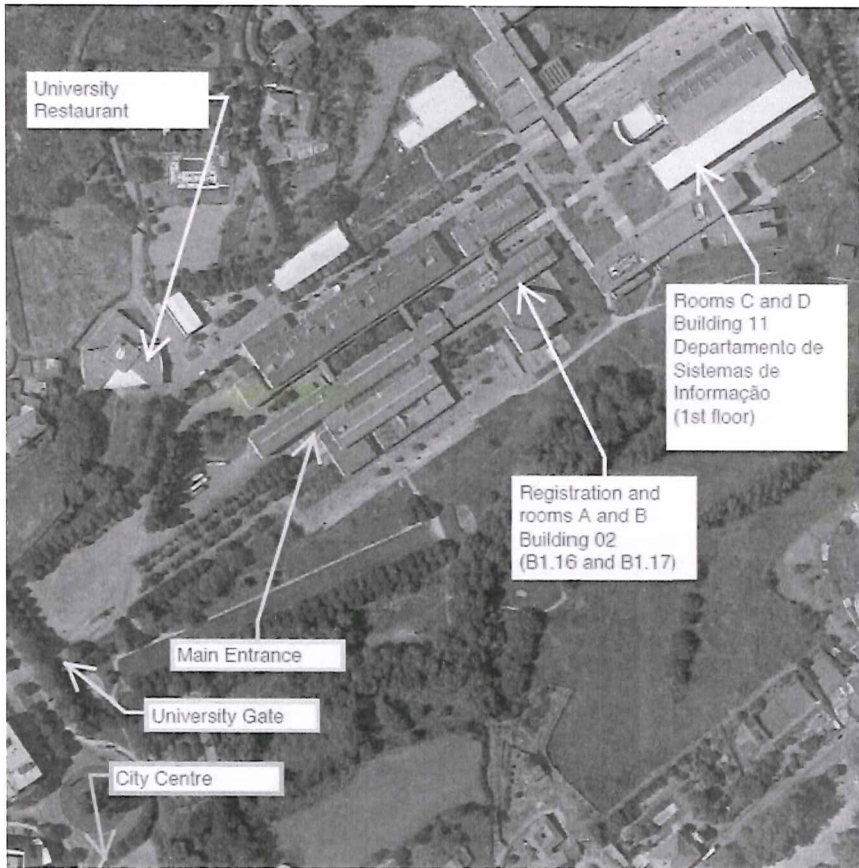
7 th July 2016	
18:00	Break
18:15	WG3.3 and WG3.7 AGM Meetings Room: C and D
19:15	Break
19:30	Dinner

8 th July 2016	
08:00	Registration open Room: Hall (Building 02; Hall do Auditório Nobre)
09:00	Symposium Roles of CS/ Informatics in the Curriculum – Why, What, How? Chair: Mary Webb Room: A
09:30	Keynote Address 4 Addressing European Union's Digital Skills Gap - Mobilizing the Key Stakeholders Professor José Carlos Zorrinho, Portugal, Member of the European Parliament Chair: Sindre Rosvik Room: A
10:30	Coffee break
11:00	WCCE 2017 Presentation Chair: Don Passey Room: A
11:15	Conference Closing Session IPC chairs – Cathy Lewin and Don Passey Lead editor – Torsten Brinda LOC chair – João Álvaro Carvalho TC3 chair – Sindre Rosvik Room: A
11:45	Break
12:15	WCCE 2017 IPC Meeting (IPC members only) Room: D
14:15	Break
14:45	TC3 AGM Meeting (TC3 members) Room: C
19:30	Close of Meeting
Social Activities	



LOCAL INFORMATION

Map of the campus



Coffee breaks:

Hall (Building 02; Hall do Auditório Nobre), close to registration and to rooms A and B.

Lunches:

University Restaurant (Restaurante Universitário de Azurém).

Internet access

For internet access you can use your Eduroam setting.

You can also access using: Username: dsi@guest; Password: dsi2016.

SESSIONS AND PAPERS (OVERVIEW)

The tables on the following pages give details of each paper, symposium and system presentation session.

Please note that:

- Each **full paper** is allowed **20 minutes** – 15 minutes presentation and 5 minutes discussion;
- Each **short paper** is allowed **10 minutes** – 5 minutes presentation and 5 minutes discussion;
- **Symposium sessions** are organised by the chair, but for programme purposes each **paper** is allowed **20 minutes** – 15 minutes presentation and 5 minutes discussion;
- Each **system presentation** is allowed **15 minutes** – 10 minutes presentation and 5 minutes discussion.

Learning and Teacher Stakeholders

(11:00, 6th July, Room A, Chair: Torsten Brinda)

003	Introducing Blended Learning MOOC: A Study of one bMOOC in Norwegian Teacher Education	Inger Langseth, Halvdan Haugsbakken	Full paper
006	cMOOC: How to Assist Teachers in Integrating Motivational Aspects in Pedagogical Scenarios?	Aicha Bakki, Chihab Cherkaoui, Lahcen Oubahssi, Sebastien George	Full paper
020	Characterizing the Players Strategies and their Evolution: A Case Study Based on Learning Analytics	Eric Sanchez, Nadine Mandran, Valérie Emin, Valérie Fontanieu, Caroline Emin	Full paper

Stakeholders and IT Management

(11:00, 6th July, Room B, Chair: Javier Osorio)

013	Fathers and Male Guardians are Important Stakeholders in Children's Education: Do Lego Activities Hold a Key to Involving Them More?	Don Passey, Gavin Hawkins, Darren Clift	Full paper
009	IT in Educational Management: Can it Support Solution of e-Cheating Problem?	Robert Gajewski	Full paper
022	Business Process Management (BPM) and E-Government at the University of Las Palmas de Gran Canaria (ULPGC)	Jorge Rodriguez-Diaz, Pablo Hernandez-Bolaños	Short paper
008	Key Elements for Gardening Innovation in Educational IT-Projects	Anton Knierzinger, Astrid Leeb	Short paper

Stakeholders and Computer Studies

(13:15, 6th July, Room A, Chair: Eric Sanchez)

002	Students' Involvement in Computer Science and their Computer and Information Literacy – Results from ICILS 2013 in an International Comparison	Julia Gerick, Kerstin Drossel, Birgit Eickelmann	Full paper
025	Modelling Competency in the Field of OOP: From Investigating Computer Science Curricula to Developing Test Items	Matthias Kramer, David Tobinski, Torsten Brinda	Full paper
012	Measuring an Impact of Block-Based Language in Introductory Programming	Yoshiaki Matsuzawa, Yoshiki Tanaka, Sanshiro Sakai	Full paper
028	Implementing Computer Science Curriculum in Primary Schools: Preliminary Report	Maciej Sysło	Full paper

Symposium: The Making of a Science Teacher(13:15, 6th July, Room B, Chair: Don Passey)

034	The Making of a Science Teacher	Christine Redman ⁸ , Seamus Delaney, Joanne Blannin ⁹ , Janet Price	Symposium
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Vocational and Professional Concerns(15:15, 6th July, Room A, Chair: Peter Micheuz)

021	Vingt Ans Après: Analysis of WG3.7's Published Work on Information Technology in Educational Management (1994-2014)	Javier Osorio	Full paper
017	Vocational and Education Training in Portugal: Pupils' ICT Competences at School and Working Contexts	Teresa Cardoso	Full paper
031	Smart Partnerships in Education: an Illustration from Ireland	Margaret Leahy, Deirdre Butler	Full paper
030	Alternative Ways of Involving Stakeholders: The Rise of Entrepreneurism in Higher Education and the Case of a Learning Enterprise	Ana Paula Correia	Short paper

Stakeholders and Pedagogies(15:15, 6th July, Room B, Chair: Cathy Lewin)

015	Opportunities for Enhancing Science Learning by Enabling Natural Manipulation in a 3D Virtual Environment	Mary Webb, Megan Tracey, Harwin William, Ozan Tokatli, Faustina Hwang, Kathryn Macaulay, Ros Johnson	Full paper
016	Introducing Collaborative Practices to Undergraduate Studies	Jaana Holvikivi, Minna Lakkala, Hanni Muukkonen	Full paper
010	Detecting Behavioural Patterns of Gifted Students in Online Learning Environment: Data Mining Approach	Zdena Lustigova	Short paper
033	Accounting for Teachers Use and Non-Use of Web 2.0 in the Upper Primary School Classroom	Joanne Blannin	Short paper

Symposium: The Role of Educators in Preparing ICT Professionals(17:00, 6th July, Room A, Chair: Moira de Roche)

039	The Role of Educators in Preparing ICT Professionals	Moira de Roche	Symposium
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System Presentations(17:00, 6th July, Room B, Chair: Maciej Syslo)

035	Detailed Analysis of "Mixed Language Coding" with Java and Block in Introductory Programming Education	Yoshiki Tanaka, Yoshiaki Matsuzawa, Sanshiro Sakai	System presentation
036	CRiPS.js: JS Library for Creative Introductory Programming Development Environment on the Web	Toshiki Takeuchi, Yoshiaki Matsuzawa, Sanshiro Sakai	System presentation

⁸ This paper will be presented by Skype and video link⁹ This paper will be presented by Skype and video link

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

(11:00, 7th July, Room A, Chair: Mikko Ruohonen)¹⁰

029	Learning Computing as a Step toward Social Inclusion	Toshinori Saito	Full paper
023	Digital Pedagogy for Enhanced Social Qualities, Collaborative Processes and Quality of Learning	Nicholas Mavengere, Mikko Ruohonen	Full paper

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

(11:00, 7th July, Room B, Chair: Mary Webb)

038	Roles of CS/ Informatics in the Curriculum – Why, What, How?	Mary Webb, Charoula Angeli-Valanides, Youusra Chtouki, Maciej Sysło, Andrej Brodник, Peter Micheuz	Symposium
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Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

(15:15, 7th July, Room A, Chair: Mikko Ruohonen)¹¹

026	Exploring the Information and ICT Skills of Health Professionals in Low and Middle Income Countries (LMIC)	Annariina Koivu, Mikko Ruohonen, Nicholas Mavengere	Full paper
027	ICT as a Catalyst to Enhance Teaching and Learning in a Resource Constrained Setting: A Case of Malawi	Richard Pankomera	Full paper
019	The Project Case: A West African Digital University	Adewunmi Obafemi Ogunbase, Roope Raisamo	Short paper

Symposium: Smart Partnerships in Education: What are they and what do they look like?

(15:15, 7th July, Room B, Chair: Cathy Lewin)

040	Smart Partnerships in Education: What are they and what do they look like?	Margaret Leahy, Amina Charania, Niki Davis, Cathy Lewin, Ana Paula Correia	Symposium
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Stakeholders and Learning

(17:00, 7th July, Room A, Chair: TBC)

032	Using Images as a Stimulus to Explore the Identity of Student Teachers in Computing	Eleanor Overland	Full paper
014	Datafication in Education: a Multi-Level Challenge for IT in Educational Management	Andreas Breiter	Full paper
024	Curriculum Issues, Competence Models and Informatics Education in Austrian Secondary Schools: Challenges now and ahead	Peter Micheuz	Full paper

¹⁰ This session will be video-recorded for later use by the chair

¹¹ This session will be video-recorded for later use by the chair

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

(17:00, 7th July, Room B, Chair: Mary Webb)

038	Roles of CS/ Informatics in the Curriculum – Why, What, How?	Mary Webb, Charoula Angeli-Valanides, Yousra Chtouki, Maciej Sysło, Andrej Brodnik, Peter Micheuz	Symposium
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Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

(09:00, 8th July, Room A, Chair: Mary Webb)

038	Roles of CS/ Informatics in the Curriculum – Why, What, How?	Mary Webb, Charoula Angeli-Valanides, Yousra Chtouki, Maciej Sysło, Andrej Brodnik, Peter Micheuz	Symposium
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PAPER SESSION: LEARNING AND TEACHER STAKEHOLDERS

(11:00, 6th July, Room A, Chair: Torsten Brinda)

003	Introducing Blended Learning MOOC: A Study of one bMOOC in Norwegian Teacher Education	Inger Langseth, Halvdan Haugsbakken	Full paper
006	cMOOC: How to Assist Teachers in Integrating Motivational Aspects in Pedagogical Scenarios?	Aicha Bakki, Chihab Cherkaoui, Lahcen Oubahssi, Sebastien George	Full paper
020	Characterizing the Players Strategies and their Evolution: A Case Study Based on Learning Analytics	Eric Sanchez, Nadine Mandran, Valérie Emin, Valérie Fontanieu, Caroline Emin	Full paper

Learning and Teacher Stakeholders

Paper 003

Introducing Blended Learning MOOC: A Study of one bMOOC in Norwegian Teacher Education

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ABSTRACT

The article discusses the implementation of a MOOC in a blended learning approach to teacher education (Key stages 8-13) in Norway. Pre-service teacher education is typically a collection of unrelated courses and field experiences. In this study, a Norwegian teacher education institution developed a blended learning MOOC, where one goal was to familiarize teacher educators and teacher students with the concept of blended learning. An additional goal was to support students' academic writing processes across courses and possibly take some of the workload connected to instruction and feedback off the teacher trainers. The MOOC content was provided by qualified educational professionals. Our study questions whether teacher educators see the point in referring student to the MOOC and whether teacher students have enough digital competence to make use of online learning objects in formal learning. In this article, we try to make sense of these findings.

KEYWORDS

Teacher education; blended learning; MOOC; digital competence.

Learning and Teacher Stakeholders

Paper 006

cMOOC: How to Assist Teachers in Integrating Motivational Aspects in Pedagogical Scenarios?

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ABSTRACT

With the advent of the MOOCs, the education stakeholders and researchers in the field of TEL are giving an enormous attention to the dropout issues in these environments. In a deeper analysis of this issue, several authors link this dropout to a lack of learners' motivation or a lack of learners' engagement, these dropout rates are also associated with an insufficiency of tools and methods that allow personalization and/or adaptation of learning activities. According to this, a promising lead resides in supporting learners' motivation and engagement via adaptation of pedagogical scenario. In this paper, we aimed to examine and analyze the literature around dropout issue in MOOCs and possible solutions to motivate learners. Our goal is to improve educational scenario building by including motivational aspects via a teacher-centered process.

KEYWORDS

Motivation; dropout; engagement; cMOOC; MOOC; educational scenario building; learning design.

Learning and Teacher Stakeholders

Paper 020

Characterizing the Players Strategies and their Evolution: A Case Study Based on Learning Analytics

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ABSTRACT

This paper presents an empirical work dedicated to the analysis of players' strategies. 242 pre-service teachers participated to a game session with Tamagocours, an online and multiplayer tamagochi dedicated to learn the legal rules that apply for the use of digital resources within an educational context. The study is based on the collection and analysis of players digital traces automatically collected (learning analytics). We perform a principal component analysis (PCA) and an ascending hierarchical classification (AHC) that enable for the identification and characterization of different classes of players depending on the strategies that they develop for playing. We also describe the evolution of the different classes during the game session. The results show mixed consequences with positive and negative evolutions in terms of learning potential.

KEYWORDS

Learning game; players' strategies; Tamagocours; learning analytics.

PAPER SESSION: STAKEHOLDERS AND IT MANAGEMENT

(11:00, 6th July, Room B, Chair: Javier Osorio)

013	Fathers and Male Guardians are Important Stakeholders in Children's Education: Do Lego Activities Hold a Key to Involving Them More?	Don Passey, Gavin Hawkins, Darren Clift	Full paper
009	IT in Educational Management: Can it Support Solution of e-Cheating Problem?	Robert Gajewski	Full paper
022	Business Process Management (BPM) and E-Government at the University of Las Palmas de Gran Canaria (ULPGC)	Jorge Rodriguez-Diaz, Pablo Hernandez-Bolaños	Short paper
008	Key Elements for Gardening Innovation in Educational IT-Projects	Anton Knierzinger, Astrid Leeb	Short paper

Stakeholders and IT Management

Paper 013

Fathers and Male Guardians are Important Stakeholders in Children's Education: Do *Lego* Activities Hold a Key to Involving Them More?

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ABSTRACT

Previous research indicates positive influences on engagement, expectation and outcomes of learning when fathers and male guardians support and work with their children. In primary school settings, fathers and male guardians are less frequently seen to be involved in educational, school-based discussions and activities. The research reported in this paper indicates how a contemporary project is positively supporting father and male guardian involvement with their children, using technologies (*Lego Technics Mindstorms* and *Scratch*-like programming) as an important medium, where building and programming enable shared and collaborative learning. The findings highlight important ways in which this project is enabling this shared activity learning, through intergenerational learning practices. Clear implications for wider national and international development are raised. Recommendations are offered.

KEYWORDS

Fathers/male guardians; learning with children; collaborative activities; intergenerational learning; primary school development.

IT in Educational Management: Can it Solve Solution of e-Cheating Problem?

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ABSTRACT

The paper tries to answer to the question – can IT tools help to solve e-cheating problems occurring during the courses of information technologies and computer sciences conducted in a computer laboratory. Scale of e-cheating leads from time to time to the situation that dishonest students have better grades than honest ones. None of the simple pedagogical solutions known from the literature helped to solve that problem so IT tools were used. First part of the paper gives the critical review of the literature of the subject. Cheating is perhaps as old as education. But nowadays due to the information and communication technology it is much easier to cheat so it starts to be a crucial problem. Cheating can be frustrating for the instructors because it can be interpreted as a direct affront. Instructors can also feel betrayed. But the most important reason is the fact that cheating can influence grades which are information how good a student is. So finally good and fair students can have worse grades than cheaters. During the last decade different forms of e-cheating were getting more and more popular during the classes in information technologies and computer sciences. Simple pedagogical hints like: “use strict controls”, “make the rules clear and have known penalties”, “design assessment instruments that make cheating difficult” and “develop climate that will reduce the likelihood of cheating” did not help. So the main motivation to start this research was a strong will to change this immoral situation by means of IT tools. Unfortunately, there are only few papers devoted to technical issues and moreover presented solutions cannot be directly used for presented subjects and classes. In order to learn what is the attitude towards cheating among Polish students two surveys were conducted. First survey was based on yearly surveys from Gettysburg in USA and second was based on two surveys conducted by Monash University in Australia in 2000 and 2010. Analysis of results shows that there exist very big cultural differences in students’ attitude to cheating in different countries. The biggest differences were observed for the survey from Monash University. Results of survey conducted in Poland are much alarming (indicate more e-cheating related problems) than Australian. Especially big differences are in the case of the three following scenarios: copying material from the book or from the Internet, swapping assignments with another person, using a hidden sheet of paper with important facts during an exam. First problem can be generally solved by means of plagiarism checkers on the university level. Second one should be mainly solved by instructor manually. Third one which can be generally called as using unauthorized materials during exams can be solved by means of specialized IT tools which will be described below. Comparison of results of the two surveys shows that cheating is a serious and important problem in Poland, so in order to prevent cheating IT solutions should be used. Nowadays problem of plagiarism BSc and MSc thesis is solved on university level by special software while problems encounter by individual instructors should be solved by themselves. The solution of plagiarism problem is still doubtful because there are many web sites which nowadays offer automatic rewording. The third part of the paper presents two software solutions of e-cheating problem in computer laboratory investigated during research – monitoring software and safe exam browser. All instructors who have classes both in a computer lab and typical class know differences in cheating possibilities. It is much easier to cheat in a computer lab when it is not equipped with specialized software. In order to prevent cheating during theoretical exams, which take the form of different tests on MOODLE Learning Management System, the Safe Exam Browser (SEB) platform was used, which fully disables usage of any auxiliary computer resources. In order to prevent cheating during practical exams LanSchool, classroom and desktop movement software was used. Its Lite, free of charge version can monitor up to 3000 students by real time computer thumbnail monitoring. Full solution of e-cheating problem can be obtained only by means of cooperation of all stakeholders of education market – university and faculty authorities, instructors and... students. Cases when students force instructors and authorities to act actively against cheating are more and more often. But on the other hand none of the technical solutions will work forever so continuous research in this field is necessary. Therefore, final remarks of the paper are accompanied by an open question – how long will all these IT solutions be valuable?

KEYWORDS

Cheating; plagiarism; collusion; e-learning.

Stakeholders and IT Management

Paper 022

Business Process Management (BPM) and e-Government at the University of Las Palmas de Gran Canaria (ULPGC)

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ABSTRACT

The development of business process management (BPM) is a key factor to launch e-Government in a public organization. This development requires first identifying the components that make up the business process management and, second, implementing them. It is just this implementation which has been presented as one of the most complex milestones in the development of BPM. In this paper the authors show how to implement the components of BPM successfully from a based on construction that deploys an organizational initiative that addresses directly a problem expressing the organization and indirectly the implementation of BPM. This methodology is justified by a case study carried out in the ULPGC.

KEYWORDS

e-Government; business process management; success critical factors.

Stakeholders and IT Management

Paper 008

Key Elements for Gardening Innovation in Educational IT-Projects

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ABSTRACT

As IT is not only a useful tool but a vehicle for the transformation and development of educational systems, the European Commission, national and regional administrations as well as other sponsors put budgets for projects at the disposal of schools, scientific institutions and companies. They demand results which will lead to sustainable improvements.

This paper presents four key points and ten sets of questions which can be helpful and should be considered when projects should lead to better outcomes. They are rather independent of size and aims of the project, the scientific level and the height of the budget. Beside scientific work the main source of this paper is the own experience and the monitoring of educational IT-projects in Austria through two decades by the authors. This expertise is mainly taken from projects done by Education Group, a governmental agency supporting schools by the integration of ICT.

KEYWORDS

Innovation; project; ICT; schools.

PAPER SESSION: STAKEHOLDERS AND COMPUTER STUDIES

(13:15, 6th July, Room A, Chair: Eric Sanchez)

002	Students' Involvement in Computer Science and their Computer and Information Literacy – Results from ICILS 2013 in an International Comparison	Julia Gerick, Kerstin Drossel, Birgit Eickelmann	Full paper
025	Modelling Competency in the Field of OOP: From Investigating Computer Science Curricula to Developing Test Items	Matthias Kramer, David Tobinski, Torsten Brinda	Full paper
012	Measuring an Impact of Block-Based Language in Introductory Programming	Yoshiaki Matsuzawa, Yoshiki Tanaka, Sanshiro Sakai	Full paper
028	Implementing Computer Science Curriculum in Primary Schools: Preliminary Report	Maciej Sysło	Full paper

Stakeholders and Computer Studies

Paper 002

Students' Involvement in Computer Science and their Computer and Information Literacy – Results from ICILS 2013 in an International Comparison

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ABSTRACT

Based on the dataset of the International Computer and Information Literacy Study (ICILS 2013) measuring the computer and information literacy (CIL) as a cross-sectional competence of 8th graders in 21 educational systems for the first time, this paper examines whether students studying the subject area of computer science in school have a higher level of computer and information literacy compared to those not studying this subject area. The results of the international comparison reveal that only in two countries – namely Russian Federation and Chile– students studying computer sciences in school have a significantly higher level of CIL. The results will be discussed against the background of national context information with regard to ICT in education. Furthermore, implications for further research are developed.

KEYWORDS

Computer and information literacy; ICILS 2013; computer science; computer use; secondary school.

Stakeholders and Computer Studies

Paper 025

Modelling Competency in the Field of OOP: From Investigating Computer Science Curricula to Developing Test Items

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ABSTRACT

In this paper, we describe the results of a thorough analysis of 44 K12 computer science curricula and standards documents conducted as part of an ongoing research project aiming at the development of a competency structure model and measurement instruments in the field of introductory object-oriented programming (OOP). The curricula analysis builds upon a first model draft derived in prior work theoretically from a literature analysis concerning existing competency models in other disciplines (such as maths, science or language education), these models' common structures and theoretical and empirical results in the field of learning and teaching OOP. The model draft is 4-dimensional and consists of the four competency dimensions 1) OOP knowledge & skills, 2) Mastering representation, 3) Cognitive processes and 4) Metacognitive processes. We used these dimensions and the belonging sub-dimensions as a coding scheme and coded competency facets concerning OOP contained in the curricula and standards documents using the method of qualitative content analysis according to Mayring. This way, we could firstly successfully prove the curricular validity of our model draft and secondly, after a step of paraphrasing the identified competency facets, use these descriptions to initiate the process of item development to operationalise our competency model draft.

KEYWORDS

Competency modelling; item development; competency measurement; object-oriented programming; K12 education.

Stakeholders and Computer Studies

Paper 012

Measuring an Impact of Block-Based Language in Introductory Programming

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ABSTRACT

A use of block-based visual language in introductory programming is popular way in education. However, there are few research which provides evidences shown an advantage of block-based language. The paper presents the results of learning data analysis with fine grain logs recorded by students' development environment where the students can select their language in block-based or Java. The total of 400+ students' logs collected each of four years were analysed. The result shows that migration from Block to Java can be consistently seen in every year, although the whole block-editing rate was influenced by the method of instructor's introduction. In spite of block-editing did not affect working time and LOC, it could reduce the compile error correction time, whereas using Java requires approximately 20% of compile error correction time to students. We concluded that block-based language worked to encourage students to focus high-level algorithm creation, as well as it provides an advantage to understand text-based language.

KEYWORDS

Programming education; block-based language; learning analytics; working time analysis; compile error analysis.

Stakeholders and Computer Studies

Paper 028

Implementing Computer Science Curriculum in Primary Schools: Preliminary Report

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ABSTRACT

The paper deals with some aspects of the new computer science curriculum implemented in Poland. The main focus is on the K-6 levels of education. We provide a preliminary comment on the ideas how to introduce computer science on the lowest level of education by using variety of student activities, working methods, and tools provided by various stakeholders. The main approach is based on computational thinking understood as a collection of mental tools and skills originated in computer science.

KEYWORDS

Programming; computational thinking; computer science in K-6.

PAPER SESSION: VOCATIONAL AND PROFESSIONAL CONCERNS

(15:15, 6th July, Room A, Chair: Peter Micheuz)

021	Vingt Ans Après: Analysis of WG3.7's Published Work on Information Technology in Educational Management (1994-2014)	Javier Osorio	Full paper
017	Vocational and Education Training in Portugal: Pupils' ICT Competences at School and Working Contexts	Teresa Cardoso	Full paper
031	Smart Partnerships in Education: an Illustration from Ireland	Margaret Leahy, Deirdre Butler	Full paper
030	Alternative Ways of Involving Stakeholders: The Rise of Entrepreneurism in Higher Education and the Case of a Learning Enterprise	Ana Paula Correia	Short paper

Vocational and Professional Concerns

Paper 021

Vingt Ans Après: Analysis of WG 3.7's Published Work on Information Technology in Educational Management (1994 – 2014)

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ABSTRACT

In this paper, articles published in the proceedings of the IFIP Working Group 3.7 Conferences during its twenty years of existence are reviewed. This work is a continuation of a previous one that classified the most relevant topics addressed by the Group in its first ten years and the major research methodologies adopted by the contributors to carry out their work. The paper has been structured to facilitate the comparison of the Group's first decade of activity with the second decade. The review shows that the topic of Assimilation and integration of IT into educational management continues to be the leading theme in publications. The published work by IFIP Working Group 3.7, which accounts for some 213 papers, is a good indicator of the maturity of the research on information technology in educational management (ITEM).

KEYWORDS

ITEM; proceedings; research topics; research methodologies.

Vocational and Professional Concerns

Paper 017

Vocational and Education Training in Portugal: Pupils' ICT Competences at School and Working Contexts

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ABSTRACT

In this paper, we propose to reflect on digital literacy and youth 2.0 skills on a vocational schooling, with considerable penchant of immersion and contact with the labour market through training in a real work environment and the role of school in preparing for this challenge. For this purpose, we opted for an exploratory study of three groups of vocational course of a basic level, in a school of a group of Lisbon (Portugal) in 2013/2014 and 2014/2015. We used questionnaires to students and instructors of training in a real work environment, complemented by participant observation. We concluded that the young people surveyed reveal features that allow it to be considered as digital natives. Cumulatively and by evaluating whether the students themselves or the stage monitors, allowing us to conclude of the success that this initiative shows, both the level of the trainees as organizations and monitors that receive them, although the potential inclusion of tools 2.0 in the workplace should require a closer look by the School.

KEYWORDS

Vocational education and training, ICT and web 2.0 competences, digital literacy, Portuguese basic school system, pupils and labour market

Vocational and Professional Concerns

Paper 031

Smart Partnerships in Education: An Illustration from Ireland

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ABSTRACT

As defined by Davis et al. (2015), Smart Partnership (SP) in education have partners within and beyond education with a shared purpose that evolves into a synergy with strategic and holistic approaches that enhance the quality of education with digital technologies, harnessing technology 'smartly' both in relation to learning and support of the partnership itself. In addition, all partners recognise their role in the emergent process and facilitate their own organisation to change in ways that may sustain and scale the SP. This definition is used as lens to describe and analyse a SP from Ireland which has developed and matured over nine years. Analysis highlights the importance of leadership within and across the ecologies of the partnership: school, region etc. in order to support, sustain and develop the partnership.

KEYWORDS

Smart Partnership; education industry partnership; 21st century learning; teacher learning.

Vocational and Professional Concerns

Paper 030

Alternative Ways of Involving Stakeholders: The Rise of Entrepreneurism in Higher Education and the Case of a Learning Enterprise

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ABSTRACT

The education field has not traditionally stressed entrepreneurship; however, in light of current difficult economic scenarios and shrinking global job markets, a myriad of Ed Tech entrepreneurs is emerging across the world. Edupreneurs are here. They are self-motivated members of an enterprise who can recognize opportunities and take action on complex educational problems while aiming to create social value, financial value, and/or social benefits. Stakeholders hold a critical role when relating with edupreneurs. The purpose of this presentation is to discuss the rise of entrepreneurship in higher education and explore the case of a learning enterprise that supports the preparation of educational technologists as up-and-coming entrepreneurs. The development of such a learning enterprise is connected to the concept of civic-minded professional who someone interested in using his or her knowledge and skills for the public good. The learning enterprise enhances its members' civic-minded agency, meaning the group's purposeful and reflective acts that aim to address community members' educational needs. Stakeholders are deeply involved in addressing needs and issues in collaboration with educational technologists.

KEYWORDS

Entrepreneurism, civic-minded professional, educational technology, stakeholders

PAPER SESSION: STAKEHOLDERS AND PEDAGOGIES

(15:15, 6th July, Room B, Chair: Cathy Lewin)

015	Opportunities for Enhancing Science Learning by Enabling Natural Manipulation in a 3D Virtual Environment	Mary Webb, Megan Tracey, Harwin William, Ozan Tokatli, Faustina Hwang, Kathryn Macaulay, Ros Johnson	Full paper
016	Introducing Collaborative Practices to Undergraduate Studies	Jaana Holvikivi, Minna Lakkala, Hanni Muukkonen	Full paper
010	Detecting Behavioural Patterns of Gifted Students in Online Learning Environment: Data Mining Approach	Zdena Lustigova	Short paper
033	Accounting for Teachers Use and Non-Use of Web 2.0 in the Upper Primary School Classroom	Joanne Blannin	Short paper

Stakeholders and Pedagogies

Paper 015

Opportunities for Enhancing Science Learning by Enabling Natural Manipulation in a 3D Virtual Environment

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ABSTRACT

This paper discusses the aims and rationales for developing the use of haptics (virtual touch) for learning science in secondary schools. Haptic interfaces enable students to directly manipulate objects far more realistically than is possible through interfaces such as mouse and tracker ball etc. The paper considers issues in understanding concepts in science focusing on cell biology and how a 3-D environment and particularly haptics could provide learning affordances to enable learning of difficult concepts. In this endeavour, a number of educational and design challenges need to be addressed. First we need to identify the level of detail and realism that is appropriate for the school curriculum and will support learning and visualisation rather than confuse through its overcomplexity or create misconceptions through oversimplification. Secondly we need to integrate the use of the 3-D environment into classroom teaching by identifying relevant pedagogical challenges and solutions. Significant design challenges include navigating the content and scale changes involved in moving between the visible, microscopic and nanoscale in an intuitive and realistic way and enabling collaborative learning.

KEYWORDS

Haptics; science learning; virtual learning; visualisation; cell biology.

Stakeholders and Pedagogies

Paper 016

Introducing Collaborative Practices to Undergraduate Studies

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ABSTRACT

The changes in software industry and software development methods call for appropriate teaching methods in the academia. In addition to theoretical knowledge and coding practice, familiarity with common practices in the industry are expected from the graduates. Team work, collaboration and communication skills are essential demands for software engineers. These skills take years to develop, and therefore, this study presents how collaborative practices were introduced right in the beginning of information technology studies. The results of project based courses were encouraging in terms of student achievements and course completion rates. Additionally, feedback from students through an extensive survey was largely positive.

KEYWORDS

ICT education; collaborative practices; professional competences; PBL.

Stakeholders and Pedagogies

Paper 010

Detecting Behavioural Patterns of Gifted Students in Online Learning Environment: Data Mining Approach

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ABSTRACT

This paper presents selected results of data mining analysis of educational (and psychological) data, collected within 5 years on the group of 91 children, who participated in a specific online educational program for gifted children, organised by Charles University in Prague. The information record for each case (student) is represented by 151 variables, of both categorical and metric nature, describing 1) personal characteristics, including motivation and intelligence 2) behavioural and action records, including individual decision making records, and 3) particular educational results and learning path. The study is based on comparison of students with very similar personal characteristics like motivation and intelligence and their study results. Student, who had chosen the right courses, that matched his/her nature of talent and personal characteristics, succeed. An individual, who for some reason chooses the course that does not match his /her nature of talent, is more likely to fail. Both, course selection and connected educational success within selected course, is affected mostly by all components of intelligence, except of crystalline, and also by selected components of motivation, especially Dominance, Independence and Persistence. The nature of talent seems to be determined besides factors mentioned above by selected components of creativity.

KEYWORDS

Gifted children; data mining; online learning; behavioural patterns.

Stakeholders and Pedagogies

Paper 033

Accounting for Teachers Use and Non-Use of Web 2.0 in the Upper Primary School Classroom

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ABSTRACT

Information and communication technologies (ICTs) have become ubiquitous in our society. In particular, 10 to 12 years old (primary school aged) children report that they increasingly rely upon ICTs for social interaction and for learning [1]. Despite the large number of students reporting high ICT use, research indicates that many primary school teachers are not making effective use of online resources in the classroom. There is also an increasing concern that the effective use of ICTs in education has not yet received the research focus necessary for deeper integration of ICTs to occur [2]. The number and scope of ICTs available to teachers is vast and continues to expand. There is one sub-section of ICTs in particular that appears to be growing very quickly within schools and which has also received limited research focus. It is often referred to as Web 2.0 [3]. Web 2.0 resources appear to offer innovative learning opportunities but they also require many teachers to change the way they plan, interact and teach their students. Indeed, as more and more Web 2.0 resources, websites and online tools become available the role of the teacher will increasingly be to take content-free online tools and use existing pedagogical skills to create online content and learning experiences for individual learners [4]. With the changes to pedagogy these resources appear to require, and with consideration of the rapid growth in their use by children, this study has focused on Web 2.0 resources (rather than ICTs as a whole), and considers the role of support, training and socio-cultural factors in teachers' choices to integrate Web 2.0 resources into classroom learning programs.

KEYWORDS

Web 2.0; education; teacher learning; positioning theory; educational technology; primary school.

PAPER SESSION: STAKEHOLDERS AND LEARNING

(17:00, 7th July, Room A, Chair: TBC)

032	Using Images as a Stimulus to Explore the Identity of Student Teachers in Computing	Eleanor Overland	Full paper
014	Datafication in Education: a Multi-Level Challenge for IT in Educational Management	Andreas Breiter	Full paper
024	Curriculum Issues, Competence Models and Informatics Education in Austrian Secondary Schools: Challenges now and ahead	Peter Micheuz	Full paper

Stakeholders and Learning

Paper 032

Using Images as a Stimulus to Explore the Identity of Student Teachers in Computing

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ABSTRACT

The computing curriculum in English secondary education is now officially in its second year of implementation. A new, specialist group of student teachers are currently being trained to be able to deliver the new, rigorous computing curriculum. In this emerging curriculum area, it is essential teachers explore their own identity, beliefs and values in order to deliver effectively and ensure enjoyment for both themselves and the pupils they teach. In this study, the student teachers engage with images and place them in a hierarchy to stimulate honest discussion and exploration of computing teacher identity. Whilst the student teachers resonate with approaches in the classroom, such as group work, engagement with the computing curriculum topics themselves are limited and show an area which may require more attention and challenge in the computing teacher training program.

KEYWORDS

Computing education, ICT education, student teachers, ITE, images, diamond 9, teacher identity.

Stakeholders and Learning

Paper 014

Datafication in Education: a Multi-level Challenge for IT in Educational Management

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ABSTRACT

While data-driven decision-making has become a new paradigm for school development and accountability, research on the underlying ICT infrastructures and the ICT management processes have been less prominent. With the trend of datafication, educational management gains new options but also requires adequate controlling mechanisms to take care of the data and to account for privacy and security. The information management cycle can be used to define all relevant aspects of the management process. This is adopted to the specific situation of educational institutions and furthermore extended to account for the different levels of educational governance. This leads to a new concept of educational technology governance as a necessary frame for supporting datafication processes.

KEYWORDS

Educational governance; ICT management; datafication; information technology governance.

Stakeholders and Learning

Paper 024

Curriculum Issues, Competence Models and Informatics Education in Austrian Secondary Schools: Challenges Now and Ahead

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ABSTRACT

At the core of this paper lies an overview of recent developments of recent Austrian curricula issues in the field of digital education. It puts this important part of educational governance into a broader and international perspective, comprising the Darmstadt model and considerations about the nature of curricula. The coexistence and interdependency between competence models, national curricula and educational standards are elaborated, together with exemplary in-depth aspects of secondary digital education. After critical reflections about the continuing lack of a coherent and compulsory digital education at lower secondary level, recent amendments of Austrian Informatics curricula for upper secondary level are presented and reviewed.

KEYWORDS

Informatics; curriculum; digital competence; educational standards.

SYMPOSIUM: THE MAKING OF A SCIENCE TEACHER

(13:15, 6th July, Room B, Chair: Don Passey)

034	The Making of a Science Teacher	Christine Redman ¹² , Seamus Delaney, Joanne Blannin ¹³ , Janet Price	Symposium
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¹² This paper will be presented by Skype and video link

¹³ This paper will be presented by Skype and video link

Symposium: The Making of a Science Teacher

Paper 034

The Making of a Science Teacher

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ABSTRACT

From commencement forward teacher-candidates (TCs) are introduced to rigorous information and communications technology (ICT) pedagogies and skills that they will need as professional educators. This symposium discusses: the current state of the TCs' ICT skills as they enter their teacher-training; the ICT expectations and responses of their instructors; the ICT requirements they will encounter as they complete their teacher training; and, the ICT capabilities applicable to their own eventual curriculum and laboratory creativity. From the general to the specific, this group of presenters shares both data and experiences as they construct a potential model for responding to the pre-service science-teacher-in-training's digital learning needs and the implications for university educators responding to their pre-service teachers' needs, aligned with the expectations of today's teacher as a professional life-long-learner.

KEYWORDS

Academic ICT gap; ICT; professional learning network; science education; teacher candidate.

Symposium: The Making of a Science Teacher

A Guide to Close the Academic ICT Gap

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ABSTRACT

This paper presents a combination of issues that together constitutes the Academic ICT Gap that exists between the commencing student and their respective university. It reports on the compilation of an Academic ICT Guide that can be referenced as we close The Gap.

Examining Contemporary Uses of Digital Technologies by Pre-Service Teachers Enrolled in Science Education

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ABSTRACT

This paper seeks to better understand digital learning and have a more informed set of expectations of digital technology for learning. We have documented the Teacher Candidates' (TCs) everyday digital use on their arrival, and coded these uses to note any significant shifts occurring progressively. This paper presents key points of interest in the data sets that have been surprising and the subsequent implications for TCs and their academics tutors.

Supporting Science Teacher Educators' Use of Digital Technologies

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ABSTRACT

This paper reports on developing digital capabilities in science teacher-educators as they work with TCs to prepare them for their professional teaching role in schools.

Symposium: The Making of a Science Teacher

**Incorporating Collaborative Experiences and Self-Reflection Through
a Technology-Facilitated Professional Learning Network for Pre-Service
Chemistry Teachers**

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ABSTRACT

This paper documents how pre-service teachers perceived their involvement in a technology-facilitated professional learning network (PLN) centered on incorporating chemical demonstrations into their teaching.

**SYMPOSIUM: THE ROLE OF EDUCATORS IN PREPARING ICT
PROFESSIONALS**

(17:00, 6th July, Room A, Chair: Moira de Roche)

039	The Role of Educators in Preparing ICT Professionals	Moira de Roche	Symposium
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Symposium: The Role of Educators in Preparing ICT Professionals

Paper 039

The Role of Educators in Preparing ICT Professionals

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ABSTRACT

One of IFIP's strategic objectives is to develop ICT as a global profession. To achieve this goal, IP3, the International Professional Practice Partnership, was formed. IP3 is leading the development of the global ICT profession. The mission is to establish a global partnership that will strengthen the ICT profession and contribute to the development of strong international economies by creating an infrastructure that will: encourage and support the development of both ICT practitioners and employer organizations; give recognition to those who meet and maintain the required standards for knowledge, experience, competence and integrity; and define international standards of professionalism in ICT. Although IP3 works with computer societies and IT Institutes to accredit professionals and others who have met a defined standard, educators have a role to play in preparing future professionals for the world of work, and providing lifelong learning support as they develop their careers. This symposium will provide an opportunity for educators and trainers to explain how they are producing students who are ready for employment and prepared as future professionals, as well as supporting them throughout the careers.

KEYWORDS

Professionalism; ethics; CPD; lifelong learning.

Symposium: The Role of Educators in Preparing ICT Professionals

Preparing Professionals for the World of Work

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ABSTRACT

The IT Professional must be committed to a code of ethics, be trustworthy, be highly skilled and knowledgeable, and be dedicated to improving and updating his or her knowledge continually. Educators can ensure that students understand and embrace these requirements, and are able to learn quickly. Those who teach IT professionals have an important role to play in creating the rounded "professional" who is ready for the workplace. This paper will examine what a profession is, and the qualities and behaviours expected of a professional, especially in an ICT context.

Since ethical behaviour is such a core characteristic of a professional, this topic is explored in some detail. The importance of ethics in all aspects of ICT, from supply of platforms and communication tools, to software development is explained. Suggestions are made with regard to the role of educators in ethics, and how they might interweave ethics discussions into all their courses. In the light of the well documented failure of ethical decision-making in business in recent years, such as the VW "Dieselgate" scandal, the paper considers how ethical conundrums might be dealt with in the workplace. Example of codes of conduct and ethical behaviour are discussed.

The presentation will then reflect on the journey from education to employment, analysing the disconnect between what education provides, employers expect, and students feel about their chances of gaining employment after graduation. An examination will be made of the paradox of skills shortages existing at the same time as high unemployment. Possible responses from educational institutions will be explored: the challenges; and the concomitant opportunities. There is a suggestion that educational institutions should take more responsibility for ensuring that graduates find work. Employers are looking for a wide range of business and soft skills – providers must therefore find ways of teaching these skills in addition to technical skills.

Finally, the benefits to all stakeholders of preparing professionals for the world of work will be proposed. The United Nations Sustainable Development goals for 2030, all depend to a greater or lesser extent on the provision of trustworthy ICT to the Information and Knowledge Society. It is incumbent on everyone to ensure that everyone who provides ICT services are skilled, trustworthy and ethical.

Symposium: The Role of Educators in Preparing ICT Professionals

Developing ICT Professionals Using Online Learning – the Opportunity for Education and Training Providers

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ABSTRACT

This paper will explore the opportunities that education and training providers have to provide lifelong learning and continuous professional development to professionals. It will commence with a short discussion on what a professional is. Professionals, and indeed any ICT workers who wish to be accredited at a given level, which could be “Technologist” or “Professional” require a Common Body of Knowledge (CBoK). Although one would hope that ICT graduates would have this body of knowledge, ICT workers often are self-taught “techies” who were involved in start-ups and then decided that they want to develop an ICT career in a larger business. This has always been the case, but it is even more prevalent now when learners who are still at school develop apps or websites, and decide that formal education after they finish secondary school is unnecessary. If such individuals are serious about their careers, wish to be members of a professional body, and upgrade their membership over time, with professional certification as the end-goal, then they need to ensure that their CBoK passes muster. If it does not, then they need to obtain training from somewhere.

There is a requirement for ongoing learning when developing a career alongside membership of a ICT body, for two reasons: firstly, to provide the additional skills that they will need as their career develops, and secondly, to fulfil the requirement for continuous professional development and lifelong learning. Training providers can meet this requirement, whilst at the same time creating revenue generating opportunities for themselves.

Those requiring ongoing learning often prefer to complete the training online, working at their own pace in their own time. This is particularly true of millennials, who want the learning at the time of need, rather than when the next course is going to run. The presentation will reflect on how such an online training platform might be set up, and how it can be used to address CBoK requirements and ongoing learning. Ideas and concepts the education providers can explore will include:

- Aligning offerings to CPD requirements for anybody, not only graduates. Courses can be accredited by member bodies
- Helping ICT workers develop their careers will help address the ICT skills shortages, which are not at entry- but rather at mid-level
- Solutions could include formal and informal, synchronous and asynchronous interventions, so as to suit different learner styles. A hybrid solution is recommended
- Using social media platforms for peer collaboration, and tutor level support
- Providing training specific to the requirements of a member body.

**SYMPOSIUM: STAKEHOLDERS OF EDUCATION IN ICT4D:
STI (SCIENCE, TECHNOLOGY AND INNOVATION) FOR THE SDGS
(SUSTAINABLE DEVELOPMENT GOALS)**

(11:00 + 15:15, 7th July, Room A, Chair: Mikko Ruohonen)¹⁴

029	Learning Computing as a Step toward Social Inclusion	Toshinori Saito	Full paper
023	Digital Pedagogy for Enhanced Social Qualities, Collaborative Processes and Quality of Learning	Nicholas Mavengere, Mikko Ruohonen	Full paper
026	Exploring the Information and ICT Skills of Health Professionals in Low and Middle Income Countries (LMIC)	Annariina Koivu, Mikko Ruohonen, Nicholas Mavengere	Full paper
027	ICT as a Catalyst to Enhance Teaching and Learning in a Resource Constrained Setting: A Case of Malawi	Richard Pankomera	Full paper
019	The Project Case: A West African Digital University	Adewunmi Obafemi Ogunbase, Roope Raisamo	Short paper

¹⁴ This session will be video-recorded for later use by the chair

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

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INTRODUCTION

This is a call for abstracts for workshop Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals) held as part of IFIP TC3 working conference, Guimarães, Portugal on July 6-8, 2016.

This workshop provides an excellent opportunity to present and learn about recent academic work on the topic of Information Communication Technologies for Development (ICT4D). Additionally, it is a venue for possible further collaborative initiatives for research, development & innovation funding or project proposals connected to Horizon2020 and similar opportunities.

The IFIP conference attracts participants from different parts of the world, including Africa, Asia and the LAC region. All the conference participants are welcome to the workshop. In line with Sustainable Development Goals (SDGs), the workshop will include the following topics:¹⁵

- Development 2.0 - Asia, Africa and Latin America countries perspectives
- Role of ICT education for societal challenges and information society
- Innovation and sustainability in the context of ICT and education
- Globalization trends: Educational Issues for developing and emerging economies

OBJECTIVES

The workshop highlights the current agenda on the topic. The objectives are:

- To note the current work (academic, research and practice) on the topic
- To initiate collaborative research projects and partnerships for possible joint H2020 application
- To explore potential developmental inputs in line with technological advances

WORKSHOP OUTLINE

The preliminary program outline contains following:

- Introductions: Current research status – participants and research agenda introduction
- Key sessions on ICT4D specific topics, such as health, education, gender
- Project presentations and discussions
- Partnership sessions: potential collaboration avenues for Horizon2020 call and other opportunities for partnerships
- WCCE 2017 session: Preparation work for World Conference on Computers in Education (WCCE 2017, <http://wcce2017.com/>)

¹⁵ Not exhaustive list

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Paper 029

Learning Computing as a Step Towards Social Inclusion

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ABSTRACT

Social inclusion through the empowerment for socially disadvantaged groups still remains problematic in developed countries as well as developing countries. The paper attempts to propose a better understanding of the problem in the context of the information society, grounded on a fieldwork-based research which has been conducted in the field of supporting disadvantaged youth's empowerment thorough computing and informatics education. In the paper the research questions, methodologies, and the theoretical assumptions for the research will be shown. Consequently, the abstract of the findings will also be presented.

KEYWORDS

Computing and informatics education; digital divide; social inclusion; empowerment; the capability approach.

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Paper 023

Digital Pedagogy for Enhanced Social Qualities, Collaborative Processes and Quality of Learning

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ABSTRACT

The best learning environment that enables excellence should always be sought. This research seeks to draw measures to promote virtual learning experience based on promotion of social interaction and collaborative processes. The research is based on a total virtual learning experience of a masters' level information and communication technology for development (ICT4D) class at the University of Tampere. A questionnaire was conducted at the end of the course to assess social qualities, collaborative processes and qualities of learning. The research seeks to promote quality learning by developing a social and collaborative learning environment. The results of this study included measures, such as, pedagogical techniques and technological tools that could foster such an environment.

KEYWORDS

Digital pedagogy; social qualities; collaborative processes; quality of learning.

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Paper 026

Exploring the Information and ICT Skills of Health Professionals in Low and Middle Income Countries (LMIC)

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ABSTRACT

Information is at the heart of healthcare because all stakeholders including the general public, patients, health professionals and policy-makers need fit-for-purpose information to make decisions. However, producing and utilizing information in the data-intensive and ever-changing health environment requires various skills. In the particular context of low- and middle-income countries (LMIC), this study, consisting of a scoping review and a qualitative case study, explores the information and ICT skills of health professionals. Our review identifies challenges in several areas of health professionals' skills, including: computer skills; skills required for using the routine health information system; data security skills; and data management and analysis skills. Our South African case study, based on interviews, adds a more nuanced understanding of the different types of training needs. Moreover, it highlights limitations in language and basic literacy skills that undermine improvement efforts, if not addressed first. Therefore, this assessment shows that the training and education aimed at improving the ICT and information skills of the health professionals have to be versatile and to cater different groups with varying needs.

KEYWORDS

Information and ICT skills of health professionals; low and middle income countries; scoping review; South Africa case study; training needs.

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Paper 027

ICT as a Catalyst to Enhance Teaching and Learning in a Resource Constrained Setting: A Case of Malawi

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ABSTRACT

Information and Communication Technologies (ICTs) play a pivotal role in enhancing learning and teaching at all levels of education across the globe. Many developed countries appreciate that the use of ICTs has improved the quality of education. Developing countries such as Malawi have also followed suit to incorporate the usage of ICT tools in various curricula of programmes at all levels of education. Unfortunately, these resource constrained countries face a number of challenges in gleaming the maximum benefits of ICT in education sector. This paper discusses the challenges underlying ICT development in the education system in Malawi. It then provides some recommendations on how to circumvent these challenges. The paper further advances the notion that the ICT intervention in education can be meaningful and effective if all stakeholders such as government, private sector, policy and decision makers, communities, students, teachers and international agencies are engaged at all levels of the education system. This will consequently motivate learners and teachers to use ICT in their undertakings. The paper finally proposes a holistic approach to the ICT intervention in education system in Malawi.

KEYWORDS

ICT; Resource constrained; Malawi; Holistic Approach.

Symposium: Stakeholders of Education in ICT4D: STI (Science, Technology and Innovation) for the SDGs (Sustainable Development Goals)

Paper 019

The Project Case: A West African Digital University

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ABSTRACT

This paper is a project case report of a proposed West African Digital University that started based on the outcome of several research findings that focused on three West African countries mainly on export e-education through e-learning environments, which has been discussed as a way to improve African students' learning culture, designs and usability of web-based learning. The main aim and objective of this digital higher education institution are to contribute to the possible solutions to problems of higher education in developing countries, in particular the sub-Saharan West African countries by providing export e-education to West Africa citizens. The West African Digital University, put in practice, would develop students' minds and raise awareness for peace and tolerance as a way of integrating the West African region.

KEYWORDS

West Africa; digital university; higher education institution; export e-education; e-learning environment/web-based learning environment.

**SYMPOSIUM: ROLES OF CS/ INFORMATICS IN THE CURRICULUM –
WHY, WHAT, HOW?**

(11:00 + 17:00, 7th July, Room B, Chair: Mary Webb;
09:00, 8th July, Room A, Chair: Mary Webb)

038	Roles of CS/ Informatics in the Curriculum – Why, What, How?	Mary Webb, Charoula Angeli-Valanides, Yousra Chtouki, Maciej Sysło, Andrej Brodnik, Peter Micheuz	Symposium
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Roles of CS/ Informatics in the Curriculum – Why, What, How?

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ABSTRACT

In the light of a recent resurgence of interest in Computer Science or Informatics as a key academic discipline that is important in the education of all citizens, TC3 as the Education Committee of the International Federation of Information Processing (IFIP) has continued to take a lead in this important area by reviewing recent developments, identifying key issues and dilemmas and proposing ways forward. Discussions have taken place at a series of TC3 conferences and at EDUSummit 2015 in Bangkok. Outcomes have included reports, policy briefings and articles [1-6] This symposium will be led by members of the TC3 Task Force: Curriculum- deeper understanding of roles of CS/ Informatics and the EDUSummit 2015 Thematic Working Group 9 on "advancing understanding of the roles of computer science/Informatics in the curriculum". A reconsideration of computer science as a separate subject both in primary and secondary education is suggested. At EDUSummit 2015 it was argued that the major rationales for including computer science as a subject in the K-12 curriculum are economic, social and cultural. It was also argued that computer science is rapidly becoming critical for generating new knowledge, and should be included as a clear content area in curriculum in schools. The post- EDUSummit report identified key challenges and solutions for advancing understanding of the roles of Computer Science/Informatics in the curriculum as well as recommendations for policy makers, educators, industry partners and researchers (see: <http://www.curtin.edu.au/edusummit/local/docs/edusummit2015-ebook.pdf>). The symposium will include papers emerging from this work and others that focus on answers to the following questions: 1. What is the range of skills and understanding that should be developed in computer science? 2. Are such skills and understanding necessary for everyone? Should it be and remain compulsory? 3. At what age should computer science education commence? 4. How many computing languages or frameworks should a student be exposed to in the span of schooling from K-12? 5. How varied should these languages be? Should a variety of paradigms be explored? 6. How closely should the curriculum match computers available to schools and students? 7. What consideration in curriculum design should be given to emerging technologies such as quantum networks and computing? 8. What pedagogical approaches are likely to be appropriate, and how do they vary with age and other factors? 9. What are the challenges for implementing Computer Science into existing curricula and how might these be addressed? The first two papers are based on outcomes from EDUSummit 2015. The first of these papers focuses on the rationales for incorporating computer science in the curriculum and the second considers the implications for developing pedagogical content knowledge. Furthermore we discuss at what age should computer science education commence? The next paper examines the need for a computer science course for all undergraduates in non-computer science disciplines and how this has been developed in the African context of Morocco. There follows a paper on a new curriculum in Poland that develops key understandings of computer science focusing on computational thinking at K-6. The final two papers focus on two different approaches, in different countries, enabling the difficult change of incorporating computer science into an established curriculum for secondary education. The first, based on Slovenia, utilised a new textbook and assessment system. The final paper, based on the Austrian experience, examines the challenges and approaches for redeveloping informatics education within the context of a curriculum focused on competency models. The outcome from this symposium is expected to be a report that builds on the EDUSummit 2015 Report and provides recommendations for policy practice and research as well as documenting challenges and issues. Attendees at the symposium will be encouraged to discuss and contribute to this report.

KEYWORDS

Curriculum; computer science; informatics; computer literacy; digital competence; computational thinking; programming; pedagogical content knowledge.

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

Arguing for Computer Science in the School Curriculum

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Margaret Cox
King's College London, UK

Charoula Angeli
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ABSTRACT

Computer Science has been a discipline for some years, and its position in the school curriculum has been contested differently in various countries. This paper looks at its role in three countries: Australia, United Kingdom and Cyprus, to illustrate these differences. A reconsideration of computer science as a separate subject both in primary and secondary education is suggested. At EDUsummIT 2015 it was argued that the major rationales for including computer science as a subject in the K-12 curriculum are economic, social and cultural. The paper explores these three rationales and also a beneficence matrix to assist curriculum designers. It also argues that computer science is rapidly becoming critical for generating new knowledge, and should be taught organised as a discrete content area in the curriculum in schools. The paper concludes by looking at some of the key questions to be considered when implementing computer science in the school curriculum, and at ways in which its role might change in the future. In particular, we consider range of skills and understanding that should be developed and whether they are necessary for everyone. Furthermore, we discuss at what age should computer science education commence?

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

The Design of the Computer Science Curriculum and the Knowledge that Teachers Need to Teach Computer Science in K-12

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Andrew Fluck
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ABSTRACT

Adding computer science as a separate school subject to the core K-6 curriculum is a complex issue with educational challenges. The authors herein address two of them: first, the design of the curriculum based on a generic computational thinking framework, and, second, how to best prepare teachers to teach the curriculum. The first issue is discussed within a perspective of designing an authentic computational thinking curriculum with a focus on real-world problems. The second issue regarding teacher preparation is addressed within the framework of technological pedagogical content knowledge explicating in detail the body of knowledge that teachers need to have to be able to teach computational thinking in K-6. An example of how these ideas can be applied into practice is also given. While it is recognized there is a lack of adequate empirical evidence in terms of the effectiveness of the frameworks proposed herein, it is expected that our knowledge and research base will dramatically increase over the next several years as more countries around the world add computer science as a separate school subject to their K-6 curriculum.

Computer Science as a Common Core Course at Al Akhawayn University in Ifrane Morocco

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ABSTRACT

Teaching about computers as a common core subject is a requirement and has been for a few years in higher education in most countries and in Morocco specifically. Al Akhawayn University in Ifrane Morocco (AUI) has been teaching an introduction to computers as a common core class alongside other basic Microsoft applications courses. The latter were omitted in recent years because nowadays most students have more knowledge of applications like MS word, PowerPoint and other basic computing skills. In this paper we will attempt to expose the range of skills and understanding that should be developed in computer science based on the Moroccan experience at AUI and the main targeted audience for computer literacy.

The students at AUI come from different schools private/public, Moroccan/French system, and a few international students. Moroccan high schools both private and public cover the following topics in their informatics course: MS Word, MS Excel, MS PowerPoint, algorithm, programming, operating system, and computer hardware¹⁶. Thus newcomers at AUI have some computing background and since the vast majority of them come from middle to high income families they have all used/owned a computer and being closely exposed to technology in general. The computer science course, which is a common core course for non-computer science students, is called "Introduction to Computers". After teaching this course for eight consecutive years, many changes have been made mainly to tackle the following issues: first, to give the students what they need to succeed in their other courses and later in the work place. Second, to keep the students interested, engaged and enjoy the learning process. The main topics covered are: computer hardware: the system unit, input and output devices, secondary storage devices, software: system and application, networking and programming. There is a dedicated two hours per week lab session where the students get to cover file manipulations, MSDos, Excel and Python programming.

A key goal of the programme is for students to be able to better assess their system and its performance. For example, to be able to identify clearly when to upgrade the hardware; make the appropriate choice of system software that will optimize the hardware performance; differentiate and evaluate devices and thus make them better consumers; understand the security and privacy risks versus the flexibility and convenience that networks provide us with. Programming was taught using Pascal because it's known to be an educational programming language for its simple syntax. However due to the diminished resources for Pascal we switched to Python. Python has offered much greater results; its syntax as well as structure is very close to natural language so we were able to cover more topics than with Pascal. We have added Raptor as a tool to teach algorithms in the lab which helped dramatically the students understand the concepts of decision and repetition.

For the lab the major change besides changing the programming language and adding Raptor is omitting Ms Access and adding more Excel tools. This change was done after consulting with the other schools in the University about the knowledge they want their students to have to better prepare them for other courses. So we found that MS Access is never used and Excel is widely used and was requested by many course professors from business and humanities schools. We are able to keep the students engaged most of the time, fewer students are dropping the course, higher grades and finally the students can write more complete programs from scratch as well as build algorithms. This course will continue to change depending on the changes in technology, computers hardware/software, the changes in the student's prior computing skills and the needs of the workplace. The goal of this course is to continue to prepare students so that they can interact with technology to integrate it in their life/work and use it to increase their productivity and reduce their work time.

¹⁶ <http://www.9rayti.com/matiere/informatique>

**Implementing Computer Science Curriculum in Primary Schools:
a Preliminary Report**

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ABSTRACT

The paper deals with some aspects of the new computer science curriculum implemented in Poland. The main focus is on the K-6 levels of education. We provide preliminary comments on the ideas on how to introduce computer science at the lowest level of education by using variety of children activities, working methods, and tools provided by various stakeholders. The main approach is based on computational thinking understood as a collection of mental tools and skills originated in computer science.

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

Development of CS Curriculum for Secondary Schools Through Changes in External Examination and Textbooks

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ABSTRACT

Currently in Slovenia Computer Science (CS) is taught in a nine-grade primary school as an elective subject in grades 4 to 9. Further, in a general secondary school (gymnasium) it is taught in the first year as a mandatory subject and in the later three years as an elective subject. In Slovenian, like in most school's systems, introduction of a new subject is next to impossible, and even substantial curriculum change is very hard. Indeed, the valid curriculum is written fortunately very openly giving teachers quite some freedom in choosing the topics. On one hand such a freedom is very helpful, but on the other hand brings problems. The main problem is that the high school curriculum just lists 100 learning objectives, but does not spell which of them are mandatory (to be taught in the first year) and which are to be taught in the elective years.

Consequently, we took a different, a two-step approach to improve high school CS education. The first step was an introduction of a new textbook. As the last textbook was written 18 years ago, the new textbook for CS was more than necessary. The topics we introduced in it, cover very much the same areas as are recommended by the latest ACM CSTA curriculum framework. More details on the content of the textbook will follow in the full version of this contribution. The full version will also discuss the format of the textbook (online, openness, interactivity, free access, etc.) and also present the first reflections from teachers.

The secondary education in Slovenia ends with a nation-wide external assessment called matura. One of the possible subjects on matura is also CS (or Informatics). The change in matura examination of CS was the second step. We rephrased the goal of the examination by splitting it into (i) digital literacy, (ii) use of digital technology, and (iii) basic knowledge of CS. In particular, the later was in past often neglected in matura examination and in particular in teaching itself. The first changes to matura were introduced three years ago and the full contribution will also discuss some results of the change.

Symposium: Roles of CS/ Informatics in the Curriculum – Why, What, How?

Curriculum Issues, Competence Models and Informatics Education in Austrian Secondary Schools: Challenges now and ahead

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ABSTRACT

At the core of this paper lies an overview of recent developments of recent Austrian curricula issues in the field of digital education. It puts this important part of educational governance into a broader and international perspective, comprising the Darmstadt model and considerations about the nature of curricula. The coexistence and interdependency between competence models, national curricula and educational standards are elaborated, together with exemplary in-depth aspects of secondary digital education. After critical reflections about the continuing lack of a coherent and compulsory digital education at lower secondary level, recent amendments of Austrian Informatics curricula for upper secondary level are presented and reviewed.

**SYMPOSIUM: SMART PARTNERSHIPS IN EDUCATION: WHAT ARE THEY AND
WHAT DO THEY LOOK LIKE?**

(15:15, 7th July, Room B, Chair: Cathy Lewin)

040	Smart Partnerships in Education: What are they and what do they look like?	Margaret Leahy, Amina Charania, Niki Davis, Cathy Lewin, Ana Paula Correia	Symposium
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**Symposium: Smart Partnerships in Education:
What are they and what do they look like?**

Paper 040

**Smart Partnerships in Education:
What are they and what do they look like?**

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ABSTRACT

This symposium presents four papers relating to Smart Partnerships. Firstly, a review of relevant literature is presented together with a working definition of what constitutes a Smart Partnership. The second paper concerns a case study of a large-scale Smart Partnership in India (Integrated approach to Technology in Education) aimed at enabling disadvantaged children in rural areas to use technology to support their learning. Also from India, the third case study focuses on a more recent project called Connected Learning Initiative (CLIX). Finally, multifarious partnerships established within a large-scale European project designed to scale up ICT use in the classroom are analysed in the light of work undertaken on Smart Partnerships. Finally, Ana-Paula Correia will offer a response to the three papers presented.

KEYWORDS

Smart Partnership; education; ICT; large-scale.

SYSTEM PRESENTATIONS

(17:00, 6th July, Room B, Chair: Maciej Sysło)

035	Detailed Analysis of "Mixed Language Coding" with Java and Block in Introductory Programing Education	Yoshiki Tanaka, Yoshiaki Matsuzawa, Sanshiro Sakai	System presentation
036	CRiPS.js: JS Library for Creative Introductory Programming Development Environment on the Web	Toshiki Takeuchi, Yoshiaki Matsuzawa, Sanshiro Sakai	System presentation

System Presentations

Paper 035

Detailed Analysis of "Mixed Language Coding" with Java and Block in Introductory Programming Education

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ABSTRACT

BlockEditor, the programming environment learners use in our programming course, has a functionality of translation between Java and Block-based visual programming language (Block). This paper presents a qualitative analysis of "Mixed Language Coding" that learners make codes by alternating between Java and Block, in order to illustrate the advantage of the use of the proposed environment. We chose the top ten cases and analyzed by replaying video of the learners' programming process. We found students mainly used Block to build the algorithm. We categorized the following 3 reasons for switching from Block to Java. 1) Students did not know how to write a required program in Block. 2) Students thought it was not usable to write a program in Block. 3) Students transcribed the sample program written in Java. The results can be interpreted as the learners (university students) could switch their languages with consideration of the characteristics including advantages/disadvantages for each language, using Block language primarily, in order to focus their algorithm construction activities.

KEYWORDS

Programing education; qualitative analysis; visual programming language.

System Presentations

Paper 036

CRiPS.js: JS Library for Creative Introductory Programming Development Environment on the Web

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ABSTRACT

We have developed a JavaScript library "CRiPS.js" designed for conducting a Creative Introductory Programming Development Environment on the Web. Although it is convenient for learners to use a browser for the programming environment, by using JavaScript in educational situation, has the following two obstacles: 1) despite Turtle Graphics requiring a blocking functionality to display full drawing animation to learners, JavaScript does not support concurrent programming in default state using blocking function, 2) debuggers provided by browsers are not easy to use for learners and subsequent cost to create the new one, due to the architecture of the JavaScript engines. CRiPS.js solves the problem by two levels of API layering designed for learners, teachers and educators. The first layer supports the concurrent programming where learners can write the programs sequentially within the thread. The second layer design UI in HTML can be customized by educators to create their own tool. This library is freely available to anyone as CRiPS.js is Open Source Software.

KEYWORDS

Turtle graphics; JavaScript.

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