

OCCE 2020

**Open Conference on Computers in Education
Empowering Teaching for Digital Equity and Agency**

BOOK OF ABSTRACTS





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022-25525007/64



DAY- I

Library Conference Hall-Main Campus

8:30 AM : Registration (Quadrangle)

9:00 - 9:05 AM : Welcome by LOC Chair introducing TISS Director and IFIP Team

9:05 - 9:15 AM: Address by Director, TISS

9:15 - 9:30 AM: Address by Chairs of the conference - Don Passey and Therese Keane and Chair of IFIP TC3 - Sindre Røsvik

9:30 - 9:45 AM : Introduction to the Conference Theme - Prof. Don Passey

10:00 - 11:00 AM : **Keynote Address by Davide Storti**

Chair: Don Passey

Youth education projects in computer science and making mobile apps: a worldwide perspective

11:00 - 11:30 AM : **TEA BREAK (Foyer outside Library Conference Hall)**

11:30 - 12:30 PM : **Breakout room 1 (Board Room - New Campus)**

Full Paper

Chair : Mikko Ruohonen

- Preliminary Learning and Teaching Outcomes of Project Based Learning with ICT (Page#48)
- Amina Charania, Ishmeet Kaur, Sumegh Paltiwale and Durba Sarkar
- An Engineering Approach for Writing a Research Manuscript (***)
- Rebecca Dsouza, Anant Nimkar and Sunil Ghane
- Dealing with State Education Hierarchy - Challenges in Implementation: dependencies in large scale intervention projects. (Page#13)
- Shashank Parimi and Spoorthi Nidhuram
- Whoever reads the T&Cs anyway? (Page#2)
- Andrew Fluck

Breakout room 2 (Green Room - Convention centre)

Full Paper

Chair : Javier Osorio

- Learning with ICT in underserved schools in India : A study on the impact of Connected Learning Initiative (Page#34)
- Renbeni Kikon, Meera Chandran and Arundhati Roy
- IT Curricula versus Labour Market Requirements in the Area of Cloud Computing in Austria (Page#3)
- Peter Garscha and Alexander Wöhrer
- The new computer science curriculum in Poland- challenges and solutions (Page#42)
- Maciej M. Sysło

12:00 - 01:00 PM :

Library Conference Hall-Main Campus

Industry and System Foresights

Chair : Sindre Røsvik

- A Mobile Application for Building Foundational Literacy Skills in India (Page#46)
- Radhika Misquitta and Aditi Ghosh
- Learning from a foray into digital library of Indian literature for children (Page#11)
- Parul Bajaj and Jeevitha C
- Large-Scale Deployment of Technology-Enabled Reading Solution (Page#25)
- Iyer Hemavathi Murthy and Priya Viswanath
- The "WAZA" Method : How to Make MooCs for Blending Learning on Practical Skills and Knowledge (Page#4)
- Keiji Emi, Shinzo Kobayashi, Seiichiro Aoki and Toshio Okamoto

(***)Abstract not Submitted

6th to 8th January 2020

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12:30 - 01:30 PM :

Breakout room 1 (Board Room - New Campus)

Short Paper

Chair : *Therese Keane*

- **Teacher Empowerment, Training and Professional Development with ICT**
- Sunita Mohanty (Page#16)
- **Relationship Between Demographic Factors and Teachers' Performance in a TPD Program**
- Sohini Sen, Amina Charania, Rukmini Avadhanam and Ishmeet Kaur (Page#49)
- **Use of Community of Practice for In-service Government Teachers in Professional Development**
- Sumegh Paltiwale, Durba Sarkar, Dr. Amina Charania and Vijay Jathore (Page#28)
- **Authentic Learning Through Project Based Learning in ITE (Integrated Approach to Technology in Education) an Initiative of TATA TRUSTS** (Page#31)
- Srabanti Basak, Sajid Hussain Ansari, Moumita Dutta and Maman Halsana

Breakout room 2 (Green Room - Convention centre)

Full Paper

Chair : *Cathy Lewin*

- **Stereotypes of Secondary School Students Towards People in Computer Science**
- Laura Keil, Fatma Batur, Matthias Kramer and Torsten Brinda (Page#14)
- **Understanding learning behaviour of students using log from a digital game for geometric reasoning**
- Arundhati Roy and Ruchi S. Kumar (Page#33)
- **Student experiences with e-exams in a university bio-chemistry laboratory: technology problems and its impact on student experience** (Page#1)
- Mathew Hillier, Naveen Kumar and Nirmani Wijenayake

01:00 - 02:30 PM :

LUNCH (Convention Centre Lobby)

02:30 - 04:00 PM :

Library Conference Hall-Main Campus

Symposium : Exploring Issues of Inclusion in Computing Education

- *Cathy Lewin, Eleanor Overland, Louise Hayes and Mick Chesterman* (Page#9)

Breakout room 1 (Board Room - New Campus)

Short Paper

Chair : *Mikko Ruohonen*

- **Universal Design for Learning in the Indian Classroom: Supporting Struggling Learners**
- Radhika Misquitta and Rudri Joshi (Page#8)
- **Vocabulary Instruction in the Indian Classroom: Problems and Practical Solutions**
- Radhika Chandrasekaran (Page#12)
- **Digital Storytelling: Digital and Social Equity** (***)
- Sanjukta Sarkar
- **Using Passion Projects in the Indian Classroom - Building Soft Skills for the Future**
- Riddhi Gogri (Page#20)
- **Re-imagining Learning - A New Approach** (Page#22)
- Padma Iyer, Naveen Mahesh and Nandini Ramesh
- **Factors influencing student aspirations towards higher education: Findings from a baseline study of an ICT intervention in education for underserved communities** (***)
- Renbeni Kikon



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02:30 - 04:00 PM :

Breakout room 2 (Green Room - Convention centre)

Learning and Teaching Presentation

Chair : Javier Osorio

- Computational Thinking in Government Schools in Rural Assam, India
- Utpal Medhi, Durba Sarkar, Nilkamal Choudhury and A. K. Md Samsul Huda (Page#29)
- Digital Equity and Agency by Pratham InfoTech Foundation (Page#30)
- Prem Yadav, Roopa Billava, S Kapthianmuan Ngaihte and Loni Bora
- A critical analysis of aide et action's ict tool of intervention in the bandipur school development project (Page#38)
- Dhipthi Dona
- Integrating ICT in an Islamic Studies Class in Afghanistan (Page#41)
- Nadia Qazizada, Caroline Francis and Amina Charania
- Empowering Teachers Building Digital Portfolios for Professional Growth (Page#15)
- Neha Chheda and Susan L. Hillman

04:00 - 04:30 PM :

TEA BREAK (Outside respective Break-Out Rooms)

04:30 - 06:00 PM :

Library Conference Hall-Main Campus

Panel Discussion with Representatives from Government and Foundations -
Role of ICT in bridging learning and opportunity gaps: Issues of Quality,
Scale and Sustainability

06.00 PM :

End of the formal proceedings followed by Reception - High Tea
(Lobby of Library Conference Hall-Main Campus)



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DAY- II

09:00 - 10:00 AM :

Library Conference Hall-Main Campus

WG3.1 AGM

Breakout room 1 (Green Room - Convention centre)

WG3.4 AGM

10:00 - 11:00 AM :

Library Conference Hall-Main Campus

Keynote Address by Aaditeshwar Seth

Chair : Mikko Ruohonen

Participatory media, rural communities and lifelong learning

11:00 - 11:30 PM :

TEA BREAK (Foyer outside Library Conference Hall)

11:30 - 01:00 PM :

Library Conference Hall-Main Campus

Symposium : Learners and learning contexts: New alignments for the digital age - Outcomes from EDUsummit 2019 (Page#6)

- Mary Webb, Andrew Fluck, Cathy Lewin, Christine Bescherer, Deirdre Butler and Margaret Leahy

Breakout room 1 (Green Room - Convention centre)

Full Paper

Chair : Sindre Røsvik

- **Course Space: The Observatory of Courses Taken Models in Interdisciplinary Departments** (Page#21)
- Daiki Shiozawa, David Hoenigman and Yoshiaki Matsuzawa
- **Analytic Framework for designing an ICT intervention** (Page#43)
- Diksha Rehal and Soham Bhattacharya
- **Blended course for ICT Integration for teaching mathematics: Findings from design based research in India** (Page#47)
- Ruchi S. Kumar
- **A discourse analysis of OER impact on globalization in Africa Higher Education** (Page#39)
- Frederick de Heer-Mentah

01:00 - 02:00 PM :

LUNCH (Convention Centre Lobby)

02:00 - 03:30 PM :

Library Conference Hall-Main Campus

Symposium: Framework for ICT and Education Integration in Indian Secondary Schools (Page#45)

- Amina Charania, Sanjay Radhakrishnan, Rukmini Avadhanam, Uchita Bakshani, Ramaa Muthukumaran, Rishi Mazumdar and Ekta Singla

Breakout room 1 (Green Room - Convention centre)

Short Paper

Chair : Cathy Lewin

- **Learning Spaces for Computational Thinking An exemplar from India to promote Digital Agency** (Page#18)
- Panchalee Tamulee, Raason Singh and Amina Charania
- **Text Data Analysis on Answers Written in Japanese to Free Text Questions obtained at Astronomical Lectures** (Page#27)
- Seiichiro Aoki, Kazushi Sakka, Keiji Emi, Shinzo Kobayashi and Toshio Okamoto
- **Inquiry-based Mathematics Learning Using Coding** (Page#17)
- Christine Bescherer and Andreas Fest
- **On the way to a Scientific Informatics Education at Schools - Why Universities should Outreach to Schools** (Page#44)
- Gerald Futschek and Philipp Prinzing

03:30 - 04:00 PM :

TEA BREAK (Outside respective Break-Out Rooms)



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04:00 - 05:00 AM :

Library Conference Hall-Main Campus

WG3.3 AGM

Breakout room 1 (Green Room - Convention centre)

WG3.7 AGM

05:00 - 05:30 PM :

End of day Proceedings

05:30 PM:

Evening Tour and Conference Dinner
(for those who registered for this event)



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DAY- III

09:00 - 10:00 AM :

Old Conference Hall- Main Campus

Keynote Address by Padma Sarangapani

Chair : Don Passey

Continuous Professional Development for Teachers: What Works, Why and What is worth doing with ICT.

10:00 - 10:30 PM :

TEA BREAK (Ground Floor Passage of Old Conference Hall)

10:30 - 11:30 PM :

Old Conference Hall- Main Campus

Full Paper

Chair : Therese Keane

- **Meaningfulness as a driving force for women in ICT - What motivates women in software industry?** (Page#35)
- Sonja Hyrynsalmi, A.K.M. Najmul Islam and Mikko Ruohonen
- **Hidden gender lessons behind an effective teaching experience combining major IT use and a problem-based approach** (Page#5)
- Javier Osorio and Francisca Alamo
- **IGGniting STEM in Irish Girl Guides** (Page#40)
- Margaret Leahy, Deirdre Butler and Nicola Broderick

Breakout room 1 (Green Room - Convention centre)

Full Paper

Chair : Torsten Brinda

- **ICT-Rich Programming Projects** (Page#10)
- Michael Weigend
- **Integration of ICT into education: Lessons Learnt at the State University of Zanzibar and the Midlands State University in Zimbabwe** (Page#24)
- Shephard Pondiwa, Umayra Al-Nabhany and Margaret Phiri
- **The problem of teaching object-oriented programming in a heterogeneity classroom** (Page#19)
- Sima Darabi

11:30 - 12:30 PM :

Old Conference Hall- Main Campus

Full Paper

Chair : Therese Keane

- **Determinants of ICT Engagement: Study of Secondary School Teachers** (Page#22)
- Arundhati Roy and Meera Chandran
- **The agency of teachers in the 21st century - design and certification of vocational e-learning** (Page#7)
- Bent Andresen
- **ChalkLit: Empowering teachers through an Online Capacity Building Platform** (Page#23)
- Deepak Joshi, Mona Mathur and Abhinav Mathur

Breakout room 1 (Green Room - Convention centre)

Full Paper

Chair : Torsten Brinda

- **Using classroom practice as “an object to think with” to develop Pre-Service Teachers understandings of Computational Thinking** (Page#37)
- Deirdre Butler and Margaret Leahy
- **Developing Computational Thinking in Children (Years 3 to 12) Through Programming using the Technacy Theory** (Page#26)
- Jayanti S Nayak, Therese Keane and Kurt Seemann
- **Approaches to Artificial Intelligence in School Education** (Page#36)
- Peter Micheuz

12:45 PM :

Closing session of the conference

1:30 PM :

End of the formal proceedings followed by Lunch (Guest House)

02:15 - 03:15 PM :

Meeting with Editor for Publication (by Invitation)

3:15 PM :

TC3 AGM (by invitation) (Old Conference Hall)

Afternoon TC3 meeting continued on 9th January 2020

Abstracts of the Papers

Student experiences with e-exams in a university biochemistry laboratory : Technology problems and its impact on student experience

Mathew Hillier¹, Naveen Kumar² and Nirmani Wijenayake³

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Abstract. This study investigated the impact of technology related problems on students' perceptions of computerized examination technology and procedures. Measures included the suitability of the assessment task to computerization, ease of use of the e-exam software, technical reliability, and the perceived security of the approach. A case study was conducted around the introduction of computerized tests into a second year undergraduate Bio-chemistry course. A series of three e-exam trial events were conducted at an Australian University in 2019 using laboratory bench computers. All students in the course were required to undertake the series of computerized exams. Data was gathered using pre-post surveys of students' perceptions (n = 215) that included qualitative comments and Likert items. The impact on participant's responses of server slowdown at one of the sessions is examined in terms of the impact on Likert response items including their recommendation of the e-exam approach to peers.

Keywords : e-exams ·assessment ·student perceptions ·acceptance

Whoever reads the T&Cs anyway?

Andrew Fluck

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Abstract. Can a teacher enroll the whole class in an online service? Is she obliged to read the terms & conditions and legally agree on behalf of the students? What if the associated privacy policy sends data overseas? Should all the parents/guardians approve instead – and how long would that take? Copyright and copyleft concepts are contested, with each of them subject to separate terms and conditions (T&Cs). With airlines, shops and even governments providing services online, these legal agreements pose an increasing burden on the populace. This paper traces the historical invention of copyright legislation, global agreements such as the Berne convention, and subsequent dissolution of that situation. The auto-ethnographic data from 48 online services over an entire year tracks the T&Cs presented to a single individual, and the estimated professional cost of their perusal. From this data can be deduced a \$9b per annum cost burden to Australia alone, and a more global estimate can be made of the reading burden of such agreements worldwide. This is important to busy teachers who provide access to online educational resources in their classrooms, since their time is particularly valuable.

Keywords : Terms & Conditions · Privacy policies · Education · Online services

IT Curricula versus Labour Market Requirements in the Area of Cloud Computing in Austria

Peter Garscha¹ and Alexander Wöhrer²

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²University of Vienna, Vienna, Austria
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rer@univie.ac.at²*

Abstract. Creating curricula for educational institutions that meet the demands of a fast moving labour market is a complex process that can take up to several years. Especially in a field like information technology (IT), new technologies require ongoing adaptation of the corresponding curricula. A particular challenge is to put theoretical concepts, such as those taught by universities, in curricula in such a way that they correspond to the technologies that are currently required in the labour market. While this is a general problem, we elaborated it in the context of cloud computing by addressing the following questions: Is it adequately dealt with in the IT curricula of Austrian universities according to the requirements of the IT labour market? And further, how can curriculum alignments be (semi-)automated to help to better meet current IT job market needs? To answer them, the text of job descriptions and IT study plans of Austrian universities are first analyzed and later compared with a similarity metrics. After a quantitative analysis, genetic algorithms are applied to improve the coverage of the curricula.

Keywords : curriculum development · cloud computing · Austria · labour market

The “WAZA” Method : How to Make MooCs for Blending Learning on Practical Skills and Knowledge

Shinzo Kobayashi¹, Keiji Emi², Seiichiro Aoki³ and Toshio Okamoto⁴

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<https://www.beta.mandala.digital/>

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Abstract. We have developed a new method of making learning materials combining practical knowledge and practical skills in various fields. On our presentation day, we would like you to join our web site with your smartphone or tablet, so you can experience our world. Please access our beta version web site as mentioned above.

Keywords : Blended Learning ·Instructional Design ·MooCs ·Practical Skills
·Practical Knowledge

Hidden gender lessons behind an effective teaching experience combining major IT use and a problem-based approach

Javier Osorio¹ and Francisca Álamo²

^{1,2}Universidad de Las Palmas de Gran Canaria, Campus
Universitario de Tafira, Las Palmas de Gran Canaria
(Spain)

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Abstract. This paper describes the adoption and results of an innovative learning practice in a rather traditional teaching context. The participants were undergraduate students with low technical background and motivation enrolled in a mandatory Management Information Systems course. The experience, developed over eight years, illustrates how students' interest in a subject can be broadened by combining a major use of information technology and a problem-based approach. The results support that young students rapidly embody the use of information technology as a relevant tool in their learning. However, the experience showed an unexpected output: students, when allowed to choose the issue of a project, may show a certain tendency to adopt topics traditionally related to their gender. This tendency could unwittingly contribute to widening the gender gap in their professional development.

Keywords : IT · problem-based · undergraduates · gender gap

Symposium : Learners and learning contexts : New alignments for the digital age - Outcomes from EDUsummIT 2019

Mary Webb¹, Andrew Fluck², Cathy Lewin³, Christine Bescherer⁴, Deirdre Butler⁵ and Margaret Leahy⁶

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Abstract. This symposium presents outcomes and invites discussion on calls to action from EDUsummIT 2019 that examined “Learners and learning contexts: New alignments for the digital age” by drawing together experts including policymakers, practitioners and researchers. EDUsummIT 2019 addressed 13 different themes in thematic working groups (TWGs). Through a pre-meeting process of collaborative writing, intensive literature review and critical reflection, each TWG synthesized and analyzed previous research and identified recommendations for policy, practice and research. Overall the EDUsummIT addressed a range of relevant themes in relation to new alignments in the digital age: changes in human computer interactions; learners as learning leaders; creativity; machine learning; cyber wellness; learning analytics; connected learning; new teaching frameworks; models of technology integration; new paradigms for researching digital technologies; cross-cultural alignments; curriculum reforms and knowledge building associated with technological developments. In this symposium we will focus on four of these themes. Mary Webb and Andrew Fluck will examine how machine learning will have implications for both, how people learn in the future and for what learners and teachers need to know about machine learning. Cathy Lewin will examine the tensions between developing cyber-wellness in young people and rapid technological changes. Christine Bescherer will discuss how we might better connect understandings of teachers’ knowledge to their classroom practices in technology-rich contexts in relation to both new and experienced teachers. Deirdre Butler and Margaret Leahy will discuss a new framework and approach to curricula in the technological world. There will be opportunities for audience discussion in order to take forward the actions from EDUsummIT.

Keywords : learning contexts · machine learning · cyber wellness · teacher professional development · curriculum frameworks

The agency of teachers in the 21st century - Design and certification of vocational e-learning

Bent B. Andresen

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Abstract. This paper reports on a case study on the design and certification of vocational education in digital learning environments. In particular, the paper deals with the professional agency of teachers. One of the premises is that teachers have the power to influence, make choices and achieve e-learning concepts that suit the predefined learning needs of a particular target group through the optimum use of digital resources. In the case study, an external certifier provided guidance and formative feedback for the teachers. In total, 23 vocational e-learning courses were certified, and the perceived utility of this process for the teachers was examined. Data was generated by interviews with representatives of the teachers and their leaders and then analyzed via thematic analysis. The results of this analysis indicate that the main actors consider the certification process relevant and useful. All the teachers experienced a valuable upgrading of their skills in the area of e-learning design. In particular, they increased their ability to design vocational e-learning courses by using accurate terminology in a consistent manner, making their designs comprehensible for the target group and fostering cooperation at college level. In conclusion, the teachers developed the capacity to act to solve 21st century educational challenges related to lifelong and technology-enhanced learning events.

Keywords : Teachers' professional development · Design of e-learning, Certification of e-learning · Digital learning environments · Vocational education

Universal Design for Learning in the Indian Classroom : Supporting Struggling Learners

Radhika Misquitta¹ and Rudri Joshi²

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Abstract. Technology has transformed how struggling learners engage with content - how accessible materials are, how students can demonstrate their learning, and how teachers can build student engagement. Through the lens of Universal Design for Learning (UDL), teachers can ensure their classes are designed to serve all students, including children with special needs. This paper will share how UDL can be implemented in the Indian context. It will talk about the challenges faced by struggling learners, and share strategies that have been seen to be effective in Indian classrooms. The paper draws on outcome data from a six-month professional development programme (PDP) where mainstream and special educators were introduced to the concept of UDL and supported with implementing UDL strategies in their classes. Implications for the field at large are discussed.

Keywords : Universal Design for Learning ·struggling learners ·inclusion

Symposium : Exploring Issues of Inclusion in Computing Education

Mick Chesterman¹, Louise Hayes², Cathy Lewin³ and, Eleanor Overland⁴

^{1,2,3,4}Manchester Metropolitan University
{*m.chesterman*¹, *l.hayes*², *c.lewin*³, *e.overland*⁴}@mmu.ac.uk

Abstract. A new National Curriculum in Computing was introduced in 2014 to address concerns raised by the Royal Society [1] that the Information and Communications Technology (ICT) curriculum in English schools was unsatisfactory, with schools delivering low-level digital literacy skills and many students finding the content uninspiring. Instead, the Royal Society argued for greater promotion of computer science as a rigorous academic discipline, that all young people should have the right to experience it and in doing so future employer needs would be better addressed. However, to date the implementation across the UK remains patchy and fragile [1].

Our symposium focuses on the issue of inclusion in relation to the delivery of this new curriculum and the increased focus on feeding the digital skills pipeline. Currently relatively few girls are taking up GCSE computer science. The uptake of other computing qualifications is also declining for various reasons. Eleanor Overland considers how the vertical nature of the new computing curriculum may work against inclusion, through case studies of two secondary schools and a Bernstein's model of pedagogic discourse. Louise Hayes discusses how unconscious bias in the Computing curriculum and its delivery could be addressed through changes in teacher education. Mick Chesterman uses Activity Theory to explore the impact of family learning and game-making as a means of overcoming barriers to engagement with computing, with a focus on inclusion. Cathy Lewin and Eleanor Overland discuss the findings of a small-scale study that investigates the factors that influence girls' uptake of Computing subjects through the theoretical lens of Figured Worlds. In the final part of the symposium, our discussant Mary Webb will provide commentary on the issues raised.

Keywords : Computing Curriculum · Inclusion · gender

ICT - Rich Programming Projects

Michael Weigend

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Abstract. This contribution advocates designing programming lessons in a way that students use information and communication technology (ICT) extensively. The paper presents four examples of such ICT-rich programming projects with different levels of required programming expertise: 1) Write directions for walking from one place to another using Google Maps and Streetview. 2) Develop a Python program that creates a text using words and phrases from free literature. 3) Write a program that creates a list of words representing controversial issues from automatically generated interview transcripts. 4) Create a program that analyses a csv file containing the results of a self-made Google Forms survey.

The examples illustrate benefits of the combination of ICT and programming: Students discover new ICT functionality and get a deeper understanding of digital technology. They experience that programming knowledge empowers to use digital technology in new ways. Having the opportunity to use ICT tools, may motivate teenagers to go deeper into CS.

Keywords : ICT · Programming · Computer Science Education

Learning from a foray into Digital Library of Indian literature for children

Parul Bajaj¹ and Jeevitha C²

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Abstract. Tata Trusts, one of India's largest philanthropic organizations, has been working to improve the quality of education in India for over a century. Strengthening children's literature (especially in regional languages) and libraries (especially for the government school children) has been an important area of focus. The use of technology to promote reading of Indian literature for children has been a topic of interest on which we have attempted to learn by doing. Kitabket, a digital library of hand-picked story books for children by selected Indian publishers, is an ongoing pilot program of Tata Trusts since June 2016. Its first version was a product hand-made by us and piloted with 5000+ children of grades 1-8 in 2017-18 and empaneled through schools or parents. Children came from a variety of settings like residential and day-boarding schools, private and public schools. The second version is a licensed digital library platform being piloted with children of grades 6-8 in a reputed network of residential government schools since Academic Year 2018-19. The journey has taught us much about possibilities and limitations with such a digital library, children's responses to a curated collection of books brought onto a digital device, and roles that parents and schools see such a digital library play. The paper shares our insights over the journey of Kitabket spanning 3+ years.

Keywords : Digital library · Reading for pleasure · Indian literature

Vocabulary Instruction in the Indian Classroom : Problems and Practical Solutions

Radhika Chandrasekaran

The Gateway School of Mumbai, Mumbai, 400078, India
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Abstract. Given the literacy rates in the country, reading development is a key need for students in India. This paper is a case study of the vocabulary instruction practices of a school in India. It highlights vocabulary instruction as an important component of reading instruction and a step towards raising literacy levels in the country. It delineates the key problems in direct vocabulary instruction in Indian classrooms, especially those that have struggling learners in the pursuit of inclusion. This paper narrates the pedagogy for vocabulary instruction - the most important aspect of which is the use of Quizlet, an online tool for vocabulary instruction and practice, and how Quizlet supports with combatting most of the outlined problems.

Keywords : Vocabulary Instruction · India · ICT · Struggling Learners · Quizlet

Dealing with State Education Hierarchy : Dependencies in a large - scale intervention

Shashank S. Parimi¹, and Spoorthi Nidhuram²

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Abstract. Education administration in modern India is marked by a long chain of hierarchies, hours of waiting at the doorstep of the offices and a lot of back and forth of repeated paperwork. Education in contemporary India is marked by sharp inequalities, rising aspirations and are diverse and deeply contrasting. In recent years educators at local, state and national level have shifted focus from student learning to student achievement. This has led to the increase in using technology in teaching mainly to enhance student achievement. Student achievement at ground level has been travelling back to the state as an achievement through quantity not quality. The paper is based on lens of the project implementation unit of Connected Learning Initiative at Telangana. Main focus of this paper is to document experiences and challenges faced by the implementation unit, working alongside the state bureaucracy for project implementation. The journey of file/permissions /proceedings/ getting approvals at the state government to school administration and all the other go ahead required to run an intervention and providing quality learning and teaching experiences to teachers and students whilst maintaining the status quo. We have critically reflected on aspects like a journey of an official paper along a stratum of the bureaucratic paradigm and its effect within the school education administration and teachers. This paper tries to address the broader challenges of working with a state bureaucracy for implementing quality Ed-tech intervention at scale.

Keywords : Ed-Tech · Bureaucracy · Connected Learning Initiative · Implementation · School Administration

Stereotypes of Secondary School Students Towards People in Computer Science

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Abstract. Though the computer science industry has become more and more important in recent years in Germany and elsewhere, the number of students in IT-related study programs is increasing only slowly. This results in a shortage of skilled IT workforce. Additionally, women are strongly under-represented. A possible cause of these phenomena are stereotypes towards people in computer science. But what image of computer scientists do students at German secondary schools really have? In order to get an overview, 52 upper-secondary school students were surveyed by using an online questionnaire, which included both open and closed questions. The results show that the conceptions are very diverse and individual. However, some characteristics are considered more appropriate than others. For example, many students indicated that people in computer science are intelligent and good at math and science. Fewer stated that they are team players and have good communication skills. The analysis of subgroups shows tendencies that aspects such as gender, previous school experience and interest in computer science, and the personal environment of the students can influence these conceptions.

Keywords : Stereotypes · Computer Science · Conceptions · Upper-Secondary Education · K-12

Empowering Teachers Building Digital Portfolios for Professional Growth

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Abstract. This presentation aims to describe the process of creating and enabling teachers to use a digital diagnostic tool for continual teacher improvement that spells out the expectations for good teaching and learning. The Professional Growth Programme (PGP) for Teachers includes a digital tool developed by Adhyayan Quality Education Services (AQES). AQES is a social enterprise set up by educators for educators, that provides school leaders and governors with technology-based tools for school improvement. The PGP makes it possible for teachers to self-assess based on evidence that includes feedback from students, parents, peers and school leaders as well as receive external validation from educational experts. It enables teachers to build a digital portfolio of performance with evidence from their teaching, that demonstrates their mastery on the expectations in the diagnostic tool. The technology enables the teacher and the validator to triangulate evidence from artifacts of teaching, feedback received and classroom observations, and reflect on its coherence or lack thereof. The digital portfolio enables teachers to receive personalized reports based on their own self-assessment, identifying their strengths and areas for improvement. Data from all the portfolios enables teaching leaders to create school level action plans for targeted teacher professional development. Finally, the overall digital data enables the school to recognize its gaps in policy as well as the biases of teaching leaders. The teacher's self-assessment evolved from compiling a physical folder of documents and other artifacts from teaching to an online digital portfolio process. This session will focus on sharing experiences, challenges, and successes in supporting teachers to build their digital portfolios as part of the self-assessment component in this process. Implications for improving and sustaining this process will be discussed.

Keywords : Teacher empowerment · Professional development · Digital portfolio

Teacher Empowerment, Training and Professional Development with ICT

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Abstract. In this contemporary world, Information and communication technology also known as ICT has become an important aspect of life since it has the potential to accelerate, enrich, and expand knowledge and skills. Also, there is a necessity of adjusting to the modern society in order to eliminate the challenges that are faced in this knowledge age. The prevalence of ICT has resulted in prompt social, economic and technological transformation. ICT, undoubtedly has brought a greater impact in the teaching and learning quality in the field of education. For instance, ICT in research offers opportunities for the colleges of teacher education in communicating with one another by means of emails, chat rooms and many more. ICT also aids in relating experiences from college to work practices and also in creating economic sustainability for the next generation. Thus, it is important to know about the use of technology in the teacher education institutions for enhancing the classrooms of the 21st century as well as for empowering the teachers. In such a quickly shifting milieu, this paper tries to explore in what way and by what means teachers can be empowered for meeting the challenges and expectations efficiently, which is a critical concern in policy making of teacher education and professional development of teachers especially in India.

Keywords : Computer · Empowerment · ICT · Internet · Knowledge · Professional Development · Teacher Education · Technology · World Wide Web

Inquiry - based Mathematics Learning Using Coding

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Abstract. A design-based research approach is used to develop inquiry-based mathematical learning environments using coding to support the understanding of mathematics. In this paper the focus is on the theoretical frameworks used for the development of the learning scenarios. While trying to teach pre-service teachers the concept of inquiry-based mathematics learning, using coding and how to develop their own learning environments, the need to specify the roles of the coding environment in the learning process arose. Two very different roles in the learning processes played by the coding environments were identified: 'the 'feedback-giver' and the 'coercion to think'.

Keywords : Inquiry-based Learning · Mathematics Education · Coding

Learning Spaces for Computational Thinking : An exemplar from India to promote Digital Agency

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Abstract. Computational thinking is an aptitude developed to identify and dissect complex problems and thereby, provide solutions in such a way that can be represented by a human, a computer or both (Wing, 2006). It includes digital skills and beyond. It is an essential skill to navigate in contemporary world powered by science and technology. However, in Indian education system, the curriculum does not integrate computational thinking and digital agency in subjects, neither it is offered independently. Often computer science is offered as compartmentalized from other core subjects. This short paper uses the example of specially designed workshops on computational thinking for high school students in some of the marginalized sections in India exploring the interaction between computational skills and core subject concepts; empowering their digital agency in the process. The activities in these workshops were contextualized according to the socio-academic background of the students, keeping in mind the basic principles of computational thinking and digital agency. The activities in the workshop suggest students tend to develop their digital agency through their journey in these workshops. The paper concludes with recommendations on systemic integration of enhancing computational thinking related skills through learning core subjects and fostering digital agency in the process.

Keywords : computational thinking · digital agency · curriculum · India · informal learning spaces · collaborative learning

Problems with the linear educational concept in a heterogeneous classroom

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Abstract. Over the past decades, heterogeneity has increased in the German education system. Each new student brings different experiences and perspectives, but there has been no change in the current educational concept, with educational methods continuing to be based on linearity. In this linear approach, the educational concept is planned and implemented in three linear stages: introduction, development, and conclusion. All students have their own specific strengths and weaknesses in learning, and teachers usually choose content at an intermediate level. In the linear education process, some students reach the goal and others do not. If the available time is too short for some students, there are inevitable learning difficulties. The linear approach does not guide these students. Students with learning deficits cannot develop learning strategies, as they are missing cognitive capabilities or cannot employ them because they never learned them. Therefore, weaker students require guidance, moving step by step alongside capable students and reaching their goals through a targeted implication of learning strategies. The current conceptual method does not consider the developmental changes of students, and it fails to support adaptivity during the learning process. Educational reformers have examined and developed educational concepts for handling heterogeneity, such as adaptive teaching, individualizing, differentiating, and open teaching, but these are again construed in a linear manner.

Keywords : Linear teaching · Learning difficulties · Heterogeneity in the classroom

Using Passion Projects in the Indian Classroom - Building Soft Skills for the future

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Abstract. 21st-century education is about imparting to students the skills that are needed to succeed in today's world. This paper envisions shifts in using technology that support students so that become agentive, future-focused and adaptable. It also discusses the re-visioning of digital age learning that goes beyond devices and connectivity of technology to transform learning. It emphasizes on differentiation and individually using digital tools which helps develop skills that can be transferable and used as a lifelong skill. This paper discusses classroom practices that use Passion Projects having a legitimate impact on student's lives.

Keywords : Passion Project · future-ready · International Society for Technology in Education

Course Space : The Observatory of Courses Taken Models in Interdisciplinary Departments

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Abstract. University departments which are designed for interdisciplinary study fields such as social informatics inevitably have a curriculum which covers broad disciplinary areas. The curriculum allows students to create their own original diverse patterns of courses taken models. In this research, we developed an observatory system that visualizes the courses taken models by applying methodologies in the network sciences. The proposed system presents functionalities to support the users' visualization of the following: (1) Filter by grade function that filters out nodes on students' network graph, (2) Visualize student attribute function that shows student attributes by coloring the nodes on students' network graph, and (3) Cross filter function that filters out the nodes on two connected networks (the students' network and the courses network). We conducted an empirical study for approximately one hundred students in the School of Social Informatics, and the visualization was analyzed by curriculum designers. As a result, we found the student network visualization clearly indicated that the course taking models were characterized by the students' selected majors, also that the clusters formed in the courses' network graph clearly illustrated the course taking models within the interdisciplinary curriculum.

Keywords : Visualization · Network Sciences · Interdisciplinary Studies

Re-imagining Learning Beyond 8

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Abstract. Beyond 8 is a program for ages 14 and above that re-imagines the high school and college years based on the principles that work so well for children. Students should learn with freedom and fun, explore multiple interests with agency, and in ways that prepare them for fulfilling lives, not only careers. Beyond 8 offers a two-part solution. The first one being an efficiency innovation in grades 9 to 12. The primary problem that learners from grade 9 and beyond encounter is the lack of time to accommodate their personal interests and pursuits. They also need the right level of exposure to even take notice of the kind of opportunities that would unfold in any industry. The solution is built on the foundation of designing a personalized curriculum that will fit into learners' daily schedules without compromising on their pursuits. The second part of the solution is a market creating innovation by providing learners with flexible and modular courses designed to provide exposure to various industries in identified domains of interest. 2-hour Discover, 2-day Observe, 2-week Explore and 2-month Engage modules across diverse disciplines are offered on demand. These courses are developed in partnership with industry experts/practitioners. The modules comprise multiple experiences including online MOOC courses, internships, books/online reading material and face to face interactions with experts combined with a process where learners will build their digital portfolio showcasing their learning journey.

Keywords : Re-imagining Learning · High School · Modular Learning · Beyond 8 · Portfolio

ChalkLit : Empowering teachers through an Online Capacity Building Platform

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Abstract. Continuous professional development (CPD) of teachers is an established need but faces several challenges, particularly in developing countries. The sheer scale at which teachers need to be trained and other bottlenecks such as quality of content, lack of availability of trainers, financial resources and infrastructure, make it challenging to achieve this goal. Current education also plays a pivotal role if we are to meet the SDG4 goals and focus on building 21st century skills. Reports on achievement scores of Indian students indicate that the current Indian education structures are incapable of meeting the most basic needs because of the above-mentioned reasons. Multiple initiatives are attempting to fill this gap. This paper explores the globally accepted criteria for impactful professional development of teachers and evaluates major educational initiatives as per these criteria. Finally, the paper presents data and study internal and external evaluations to explore the potential role of an app named ChalkLit, an initiative by Million Sparks Foundation, to provide quality professional development of teachers at scale.

Keywords : Education Technology · Mobile Platform · Professional Development

Integration of ICT into education : Lessons Learnt at the State University of Zanzibar and the Midlands State University in Zimbabwe

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Abstract. The provision of education using ICT has been adopted by many institutions in Africa. The use of ICT is critical in knowledge- based societies such as those in Zanzibar and Zimbabwe. This study looks at how the Midlands State University (MSU) and the State University of Zanzibar (SUZA) have adopted the use of ICT in many ways. ICTs do not work for everyone in the same way. It has become inevitable, in the current digital era for educators to integrate ICT in their teaching and gradually replace traditional teaching methods with modern ones which are ICT led. The main objective of this study is to find out challenges and opportunities of using ICT in education.

Keywords : ICT · Integration · digital learning · Midlands State University · State University of Zanzibar

Large - Scale Deployment of Technology - Enabled Reading Solution

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Abstract. India has a reading crisis. Specifically, English reading and comprehension ability among students in Government schools in India is low. Studies from neuroscience suggest that multi-sensory structured learning education has significant potential to improve the systematic acquisition of reading skills. We present a case-study that leverages multi-sensory AI-driven reading technology that provides a reading and comprehension solution with speed and at scale to students in Government schools. The intervention we report in this study enhances the instructional effectiveness of teachers and the learning ability of students within the existing instructional and infrastructural framework and content, without the introduction of new instruction design, pedagogy or content. The technology deployed is flexible, cloud-hosted and operable offline across a variety of computing/mobile devices. The integration is at scale, leveraging existing IT resources offering affordability. The program is integrated with the existing curriculum during normal class hours and is implemented by teachers. We also present evidence of the impact of the program on English learning outcomes independently conducted through randomized controlled trials. We supplement assessment outcomes with feedback from teachers and students. A most recent launch across 65,000 schools in Maharashtra provides evidence of ground-level affinity for the program. We present how the project has used existing implementing and governance systems and frameworks, collaboratively, to deliver the large-scale deployment of the solution.

Keywords : Literacy · Scalable · Multi-sensory · Technology-Enabled · Reading Comprehension

Developing Computational Thinking in Children (Years 3 to 12) through Programming using the Technacy Theory

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Abstract. Rapid advancement in technology is changing our lives, socially and economically. With the aim to foster necessary skills, which includes computational thinking, creative thinking and systems thinking, in preparation for the careers of tomorrow, a new subject – *Digital Technologies* was developed as part of the Australian Curriculum for inclusion in all schools. The intent behind the *Digital Technologies* curriculum is to develop algorithmic and programming abilities in students to enable them to design, create and evaluate innovative digital solutions. Educational researchers today are exploring teaching and learning models to assist developing these abilities. There is also a relatively new model applied in teaching technology education known as *Technacy Theory*, which provides a framework to look at how children understand technology and develop the ability to innovate with the use of the technology. Technacy Theory incorporates the *Technacy and Innovation Chart*, which helps identify appropriate developmental expectations at various stages of student learning. This paper conducts a theoretical examination of the educational merits of a new model based upon a rational synthesis of *Computational Thinking* concepts with the core ideas that underpin the *Technacy and Innovation Chart*. The paper concludes that if the two are carefully combined what results is a rational and operational model that may guide an empirical study to test its merits and assist classroom teachers in diagnosing student learning and setting developmentally appropriate expectations in the teaching *Digital Technologies*.

Keywords : Computational Thinking · Technacy Theory · Programming · Child Development · 21st Century Skills

Text Data Analysis on Answers Written in Japanese to Free Text Questions Obtained at Astronomical Lectures

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Abstract. The questionnaires have been taken at the astronomical lectures named “AstroTalk”, which consists of an ordinal astronomical lecture and the special astronomical lecture using stereoscopic videos and a software. The purpose of taking questionnaires is to improve promotion of “AstroTalks” and satisfaction of participants based on statistical analysis of the responses. Multiple-choice questions and free text questions are included in the questionnaire, and we performed text data analysis with KH Coder on the answers for free text questions written in Japanese by participants. In this paper, we will show the results of the analysis on the answers for a free text question “What were the impressive things on our lecture?”. From the results, words and terms related to the topics of “AstroTalks” are appeared many times on the answers. In addition, strong connections among words and terms related to topics of “AstroTalks” can be seen in co-occurrence network. It is reasonable, if we think that the strong connections were due to what the lecturers explained to participants in their talks. Thus, it is quantitatively shown based on the statistical analysis of the answers for free text questions that the participants were impressed with the topics which the lecturers wanted to convey in “AstroTalks”. Furthermore, we will show the results of text analysis on the answers for the question “What topics of astronomy are you interested in?”. Sometimes the popular topics seen in the results were adopted when deciding topics of AstroTalks following the next time. In addition, we are developing now an active learning system connecting a student at a town and a lecturer at a city through the Internet to reduce regional disparities in educational opportunities on astronomy, using an electric blackboard.

Keywords : Text Data Analysis · Free Text Questions · KH Coder

Use of Community of Practice for in-service Government Teachers in Professional Development

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Abstract. This study is a descriptive analysis of the ICT enabled community of practice (CoP) groups of teachers in the rural state of Assam and Kolkata city of the state West Bengal. 54 teachers completed a four-months certificate course in ICT and Education offered in blended mode by Tata Institute of Social Sciences. After the 30 hours of face-to-face workshop, the course had 60 hours distance mode where the teachers work on assignments and reflection through online platforms such as Moodle and actively participate in an online community of platforms (CoP) group. Exported WhatsApp chats of these two groups were used for analysis which contained the messages and its metadata (e.g. fields like date, time, sender name, body of the message and media) wrapped in a usable format. A WhatsApp analysis tool was developed to plot and analyse the data. This paper gives the following descriptive information about the WhatsApp data using the above-mentioned fields of the messages: frequency of messages from a user, frequency of media from a user, most occurring words in the conversation (excluding most common words in English language known as *stopwords*), frequency graph of messages at different times in a day, the date-wise number of messages. The conversation was split into four periods: during face-to-face workshop, during the course, six months after the course and from six months after the course to October 2019. In both these groups, the frequencies of messages were high during the course distance period, and in all four periods the frequency of messaging peaked during lunchtime in their schools. The frequency of messages in both groups dropped to about one-third within the first six months after the course. Interestingly, while the frequency of messages in the Assam group dropped further after six months of the course until October 2019, it increased in the Kolkata group in this period. This difference could be further analysed in view of the type of activities in both these geographical areas. After the course, the frequencies of messages in both the groups had a trend to increase whenever the facilitators in the group would post a message inviting the comments from the teachers, and whenever there would be a field-level activity by the facilitators or a face to face contact with the facilitators. For all periods, seven CoP heroes had been identified in terms of maximum messages posted by the teachers on the groups. Three out of seven heroes participated at state level ICT awards and had a grade of either A- or A+. Further analysis will provide a deeper insight into the periods and time of higher participation as well as the relation between the grades and active participation of the teachers. Future analysis will aim at an separate analysis of the responses of facilitators and teachers.

Keywords : CoP · WhatsApp analysis · ICT · Natural Language Processing · Education · Education Technology

Computational Thinking in Government Schools in Rural Assam, India

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Abstract. Introducing computational thinking at school level can play an important role in highlighting algorithmic and problem-solving practices and applications of computing across disciplines, and help integrate the application of computational methods and tools across diverse areas of learning. The National Research Council (NRC) (NRC [2010]) has highlighted the importance of exposing students to computational thinking notions early in their school years and helping them to understand when and how to apply these essential skills. This presentation aims to explore the opportunities, learning and challenges of introducing computational thinking activities in rural government schools in Assam at school level and in residential camps in ITE (Integrated Approach to Technology in Education) which is a project-based learning approach with ICT (initiated by Tata Trusts and resourced by Tata Institute of Social Sciences, India. The presentation will explain how students created their own interactive stories, games, and animations such as to explain the photo synthesis or deforestation process and games based on the concept of force etc. using applications such as scratch, and turtle logo. These activities have helped students learn to think creatively, critically and collaboratively. The students also used Arduino kits and mBlock application, to create projects like automated irrigation system, smart home with fire, gas or touch alarm system. Students designed their own algorithms to make Arduino kits function to address specific problems from their existing context. Further, use of computational thinking related tools to explore concepts in curriculum and to adapt them to one's context and needs helped in their adoption and acceptance by students and teachers. whereas, computational thinking activities in a residential camp format allowed flexibility of time and space from the regular school routine and helped students engage more. Introducing these activities at school level has had its own challenges, infrastructure and time being the major ones, teachers' lack of knowledge about computational thinking and these applications also became a challenge. In spite of these challenges, there has been an increased demand of these activities in other schools who not a part of the ITE program. This large demand has also opened an arena to explore newer ways to make these activities integrated in the schooling system, and capacity building of teachers to design such activities for their students.

Keywords : Computational Thinking · ITE · ICT in Education

Digital Equity and Agency

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Abstract. Years of experiences in the field of e-education, a knowledge sharing model was designed cautiously with regard to cost effective and sustainability of the program. The intent of the program is to support the government in utilizing the resources appropriately. It aims to motivate the government teachers to understand the importance of digital education and the adoption of information technology as a mainstream medium of learning. More importantly, computer-aided learning gives the school students an appropriate exposure of information technologies at an early age.

Keywords : Bridging Digital Divide · Computer Aided Learning · Information Technology · Digital Education · Empowering Teachers

Authentic Learning through project-based learning in ITE (Integrated Approach to Technology in Education), an initiative of Tata Trusts

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Abstract. This presentation aims to explore how authentic learning is fostered through an integrated approach to technology in education (ITE) intervention in government schools and Madrasahs in West Bengal. Authentic learning, often described as an instructional approach, allows the learner to explore, discuss and construct meaningful concepts and relationships between contextual and real-world problems. In ITE, authentic learning is at play when a student tries to solve a local problem or delve deeper into a concept, using ICT tools. For example, while studying the chapter of Foods and Vitamins the students make a chart of their daily food, then research on the Internet and textbooks to make a diet chart in a spreadsheet on the calorie and nutritional value of this daily food. Also, reflect on their food habits and make decisions to improve their daily choice of food. Before ITE, the classroom lectures of the traditional teaching process were passive without much engaging and interactive content. The implementation of ITE in the field has helped the teachers with a new outlook on 21st-century education, it also encourages problem-based learning as the students now have access to technological resources and applications to engage with the learning process and make the learning more contextual and multi-disciplinary and connected to real life. From the teachers' perspective, introducing authentic learning activities through ITE has played an impactful role in making the learning process more effective where the teacher has the opportunity to design learning activities, students have the opportunity to research and go beyond the textbook knowledge. For example, in one of the science projects, the students were assigned to work on the concept of energy consumption in their household, after conducted a survey they drew a basic spreadsheet about the amount of energy used at their place after that they figured out the issues and misuse of electrical energy and came up with alternatives to stop the misuse. In the Madrasa context, ITE also envisages topics related to religious education (Integrating Dinni and Dunyavi Taalim through ITE), truly multi-disciplinary and contextual experience of bringing school subjects, religious subjects, and technology together for constructive and authentic experiences for students and teachers (Charania& Mazumdar, 2020 in the process).

Keywords : Authentic learning ·ICT in education ·ITE

Determinants of ICT Engagement : A Study of Secondary School Teachers

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Abstract. Efforts to integrate ICT in education hold the implicit aim of improving the quality of classroom teaching learning processes. However, research has shown that the existing pedagogic practices do not necessarily change with the introduction of ICT. Availability of technical support, infrastructure, school culture and beliefs about ICT have implications for adoption of ICT and practice of student- centered pedagogies. Teachers have a critical role in ICT integration, but they are limited by their own ICT skills, beliefs and attitudes towards ICT as well as the pedagogical content knowledge required for such an integration. Analysis of pre-intervention data of the Connected Learning Initiative (CLIX) project from four diverse states - Mizoram, Chhattisgarh, Rajasthan and Telangana – gives valuable insights to factors pivotal to ICT engagement of a government schoolteacher.

Responses from 522 English, Mathematics, and Science teachers reveals that teachers engaging in cross domain teaching, if trained in ICT in the subject of teaching are likely to engage in ICT engagement significantly more than the others. Access to technology – both at personal and school level – emerge to be second most important determinant of ICT engagement. Age reportedly has a significant negative effect at each level of the Hierarchical linear regression. However, controlling for the aforementioned variables along with belief about ICT and pedagogic practices can reduce the effect of age on teachers' ICT engagement.

Keywords : Pedagogy · ICT · Factors · Determinants of ICT use

Understanding learning behavior of students using log from a digital game for geometric reasoning

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Abstract. Technology has the capacity to positively impact learning behavior, learning gains and eventually promote lifelong learning among the subjects. The objective of the paper is to discuss the features of Police Quad, an open-source geometric reasoning-based game designed and developed under the Connected Learning Initiative (CLIX). The paper discusses the specific features of the game that were designed to promote positive learning behavior among students.

Based on analysis of rich database of 754 unique sessions, student engagement and the types of learning behavior witnessed in one school in the course of July 2018 to December 2018 were analyzed. The paper identifies and represents a variety of learning behaviors exhibited by students, relating it to the design principle of learning from exploration or persistence (learning from mistakes). The detailed description of the game juxtaposed with the exploratory description of its log data, shows how a game can stimulate diverse learning behaviors among students apart from the expected ones. Such exploratory analysis can further inform game design and scaffolding required for the variety of learners rather than assuming that all learners interact with games in a similar manner.

Keywords : Learning Behavior ·Game Design ·Geometric Reasoning ·learning analytics ·Learning from mistakes

Learning with ICT in underserved schools in India: A study on the impact of Connected Learning Initiative

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Abstract. The role of ICT is well recognized in policy as an important component of providing students in underserved contexts access to quality learning opportunities. This is also a question of equity given the highly stratified nature of public schooling in India where a majority of students from poor households are enrolled in government schools that are under resourced. ICT in education has the potential to play a significant role in enabling students' access to quality teaching and learning increasing attention being paid to the adoption of technology for attainment of educational goals. This paper reports findings from a study on the Connected Learning Initiative (CLIX), an intervention that seeks to integrate ICT with high school STEM curriculum through professional development of in-service teachers, across four states in India. The study conducted in 165 intervention (CLIX) and 55 control (Non-CLIX) schools covering 6851 students and 484 teachers showed that there were significant gains in student scholastic and non-scholastic outcomes in Mathematics, Science and English scores, when they were taught by teachers who had received sustained professional development for three years, and had accessed the CLIX student learning platform. Further, initial analysis indicates a positive gain particularly among girls and students from backward communities. These findings have particular implications for future ICT interventions at scale in addressing quality and equity issues.

Keywords : ICT · School Quality · Equity in education · STEM learning

Meaningfulness as a driving force for women in ICT - What motivates women in software industry?

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Abstract. The gender bias in ICT industry has been a widely discussed topic for decades. Yet, there has been not seen a great success in fixing the gender balance of IT professional, especially in the technical fields. However, the ICT industry is suffering from the expert shortage and there is need for a more diverse competence — and this could be also the moment for women to step out and enter to the industry. However, we cannot only wait that our education systems will deliver enough diversity for the labour market. In order to motivate more women to change their career to the ICT industry, we have to overall understand the professional motivation of women in ICT industry. In this paper we use the stories of 23 women who are working in ICT industry to learn more about the motivation, challenges and best practices for different career paths to the ICT industry. The results show that women in ICT value the creativity and diverse possibilities of the work in the industry and they see that industry could benefit from more diverse employees.

Keywords : Women in STEM · gender bias · gender equity · gender equality · expert shortage

Approaches to Artificial Intelligence in School Education

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Abstract. Due to recent developments in the breath-taking field of artificial intelligence (AI) and its impact on many areas of life, this paper provides an overview of that field focusing on current approaches especially in schools. After a clarification of the particular terminology in a wider context, and after a short journey into the past of AI in schools, current initiatives and AI-related approaches on a school level are described. Further, the interdisciplinary aspect of AI is stressed. This contribution concludes with some implications for the practice of AI-related school education.

Keywords : Artificial intelligence · Machine learning · Deep learning · Data science · School education

Using classroom practice as “an object to think with” to develop Preservice Teachers’ understandings of Computational Thinking

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Abstract. It is claimed that computational thinking (CT) promotes a powerful new way of thinking, that holds the promise of preparing learners to solve the many types of complex problems stemming from contemporary societal issues. Many debates centre on, if there should be a computer science curriculum for primary school level with an explicit focus on computational thinking or if computational thinking concepts should be developed in problem solving activities as part of subject areas other than computer science. However what is evident is that there is a serious need to prepare teachers to embed CT into their pedagogical classroom practices. The tendency has been to focus on in-service teachers but pre-service teachers also need to be introduced to CT principles. Attention needs to be directed not only to how pre-service teachers develop their own understandings of computational thinking but how they can design learning opportunities for their students to develop what is now considered a fundamental skill for everyone living and working in the complex connected world of the twenty-first century. This study explores how pre-service teachers understandings of computational thinking can be developed as they design and facilitate learning activities which embed the use of computational materials underpinned by constructionist learning principles within the context of curricula at primary school level your text here.

Keywords : Computational Thinking · Pre-service Teacher Education
· Constructionism

A critical analysis of aide ET Action's ICT tool of intervention in the Bandipur School Development Project

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Abstract. The Bandipur School Development Project (BSDP), is an education project of Aide et Action International NGO (AeA). Set in the Bandipur forest Reserve Karnataka, the project is in a context where the parents of the children are mostly farmers or daily wage laborers who have limited level of literacy, and it is close to impossible for them to monitor their child's performance. The project therefore focuses on building rapport with the community and getting them involved in their child's education process. Under such circumstance it is only inside the premise of the school that the child is motivated to learn from their learning material, and the school teachers are the only source of guidance with respect to their education. The major concern with the teachers appointed in these government schools is that, not all teachers have subject specific degrees, nor do they have access to knowledge repositories. For example: Teachers who opted for humanities in their higher secondary school education and pursued their graduation in the same, are required to teach science & mathematics for students in classes up to 7th. The teachers therefore find themselves incompetent to teach chapters of higher order to the students efficiently. In an attempt to address this problem, AeA consulted teachers in the buffer zone and made a list of topics that the teachers categorized as challenging for them to teach. The topics were then submitted to government school teachers, and DIET (District Institute for Education Training) resource professors, identified as subject experts. The subject experts along with the GuruG learning platform, dissected each topic on the basis of bloom's taxonomy and created a variety of lesson plans to be fed to the application. The application developed provides an elaborate explanation of the topic and displays a variety of lesson plans developed by the subject experts. The teaching learning material aims to aid the teacher and provide him/her the exposure to learn and look at innovative practices in the field. It acts as a framework that can be customized and personalized by the teacher to suit his/her teaching style and specifically cater to the individual needs of their students. A technology driven by teacher, also means that the developing of any of the 21st century skills majorly depends on his/her pedagogy. While the question of learning outcome requires more in-depth analysis, it is safe to say that the rate of enrollment has increased due to the status garnered by the intervention used in the school. A need-based construction of technology, followed by a Concern Based Adoption Model (CBAM) with stakeholders of high levels of usage and stages of concern, and a Teacher Resource Group (TRG) that acts as a continuous support mechanism, makes this intervention a considerably sustainable one.

Keywords : Rural Tribal Government School · ICT Intervention · Social Support · Educational Technology · Agency

A discourse analysis of OER impact on globalization in Africa Higher Education

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Abstract. This paper applies Foucauldian critical discourse analysis to examine the issues of power in the creation, adaptation and use of Open Educational Resources (OERs) in Africa Higher Education (HE). The power of the impact of OER as support educational material is discussed with a globalization viewpoint encompassing multi-cultural and inter-cultural education, knowledge economy and hegemony. The two main repositories found on the internet with respect to OER use in Africa HE namely, OER Africa [29] and OER@AVU [7] are analysed through Foucauldian lens. The OER culture in Africa HE, multiculturalism and diversity are explored, and these are used as the frames in the discourse analysis of the two OER repositories and affiliate networks using Foucauldian power/knowledge analysis. An abbreviated five-stage Foucault critical discourse analysis from Parker [23] twenty stages, comprising of subjects and objects, the relationship between discourses, action orientation, positionality, and discourse and power is performed on two selected discourse. The global rationale for the OER movement is extrapolated to these selected OER Africa HE discourses. OER use in Africa HE is explored to raise issues on technology-enhanced learning that are needed to be in place before Africa HE faculty can create, deliver and reflect on the OER discourse of UNESCO through the didactic and pedagogic experience of the author in Africa. The conclusion enumerates two new power actor groups in the OER discourse, education technologists and OER institutional statutory bodies that need to be in place before the digital agency of Africa HE faculty can take off.

Keywords : Open Education Resources · Foucauldian discourse analysis · Globalization · Multiculturalism · Technology Enhanced Learning

IGGniting STEM in Irish Girl Guides

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Abstract. The gender balance imbalance in STEM fields is well documented. Research reports and surveys have repeatedly shown that while young boys and girls are interested in STEM subjects, gender differences begin to emerge as subject selection becomes available, usually secondary education, and becomes progressively more pronounced through later schooling and third level (OECD, 2018). Finding ways to increase girls' resilience in STEM so that the early seeds of interest not only persist but translate into meaningful careers. Adopting a constructionist perspective, the research reported in this paper explores the introduction STEM concepts to 400 7 to 10-year-old girl guides and 40 unit leaders through a robotics project based on the real world problem of water sustainability and which they completed at their weekly meeting over a five-week period. Adopting a constructionist perspective, the research methodology centered mainly on semi-structured and informal interviews. Findings reveal that not only did the girls but also the unit leaders developed personal, social and cultural aspects of learning (Kafai & Burke, 2015).

Keywords : STEM ·out-of-school learning ·girls ·robotics

Integrating ICT in an Islamic study class in Afghanistan

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Abstract. This paper explores the use of Information and Communication Technology in teaching Islamic subjects at a secondary school in Afghanistan. The Islamic study teachers in Afghanistan have the responsibility to explain the philosophy and history of Islam using a variety of different methods and strategies. Applying ICT in the classroom such as using computers and internet connection in teaching and learning can make the learning process effective and innovative. However, in Afghanistan teachers seldom use ICT during the teaching and learning process and almost never in teaching Islamic studies. Some of the reasons of not using ICT are: lack of ICT infrastructure and teacher professional development including technical expertise by teachers. To explore the potential of ICT use by students for meaningful learning in Islamic studies, the first author as part of her assignment in ICT and Education Masters course at Tata Institute of Social Sciences, Mumbai taught and facilitated by the other two authors of this paper, undertook an ICT enabled lesson with the secondary school students in Kabul, Afghanistan. This ICT enabled lesson plan integrated the following concepts and learning at the masters' course: TPACK framework, ISTE, 21st century skills (Creativity, Communication, Collaboration and Critical Thinking) and above all the principle of Learners as Producers of ICT resources. The topic selected from the Islamic studies syllabus was Kaaba, the house of Allah. The ICT enabled activity was to enable eight students from secondary school in Kabul to construct their own knowledge by making a digital story on "the construction of holy Kaaba" using the computer, smart phones, and Internet. All eight students made took five days (one hour each day) a digital story on Kaaba using resources from the Internet, they also used Google maps to find location of Kaaba. The digital story was made using the PowerPoint presentation. The author found that these eight students were very excited, joyful and interested in learning through ICT, this was their very first experience to use and create with ICT to learn a subject area. Infrastructure, electricity and lab access were some of the challenges faced in implementing the lesson. A few students could catch use of Internet and PowerPoint very fast while others took more time to complete their stories. The students also seemed very confident in sharing their digital stories with others. This approach of using ICT enabled learning where students can create an ICT artefact to learn a subject could serve as an exemplar to advocate ICT use in subjects in secondary schools in Afghanistan.

Keywords : Integrated · ICT · teaching and learning · Islamic studies · knowledge construction · Afghanistan

The new computer science curriculum in Poland – challenges and solutions

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Abstract. The new computer science curriculum has been introduced in Poland in 2017 (for primary schools) and in 2019 (for high schools). In this short note we first describe the building blocks of the curriculum and discuss the challenges we face. Then we focus on the curriculum for high schools and present how project-based learning (PBL) supported by a flipped learning strategy can be used to organize content described in the curriculum and students' learning computer science integrated with other (school) subjects.

Keywords : Computer science curriculum structure · curriculum implementation · project-based learning (PBL)

Analytic Framework to Design an ICT Intervention

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Abstract. The integration of ICT in education is strongly advocated by the academic pioneers around the world for its potential to transform the entire system from pedagogy to content per 21st century needs. Existing research, though, suggests that the gains have been minimal often due to ill-conceived models of technology interventions. In this paper, we present a comprehensive framework that an intervention model should satisfy for leveraging the full potential of educational technology. The framework, well-embedded in literature, covers areas of instructional design, roles and inter-dependencies of stakeholders, subject-specific pedagogy with room for differentiated learning, and measures for successful adoption. Using the framework, we have analyzed three interventions existing in different domains in the Indian education system and looked at scope for their further improvement. The three interventions although shared some commonalities about teacher professional development, collaboration skills, and curriculum design but the extent to which each factor was emphasized varied according to the goals of the intervention. An important commonality that came out from this study is that all these interventions involves or even empowers the various stakeholders – educators, students, parents and school authorities at various levels. The goals sometimes modest in nature, for example, developing cognitive skills in learners couldn't be realized because different indicators aren't looked at in an integrated manner while designing the intervention. The interventions were found to strengthen the existing patterns in education as all these interventions doesn't make an intervention in the assessments of the students in the school system. Unless due attention to each indicator of the framework is given, the ability of ICT to revolutionize the education sector will remain limited.

Keywords : ICT intervention ·Quality education ·Framework ·Design ·21st century needs ·21st century skills, Education system ·Educational technology ·Students ·Parents ·Educators

On the way to a Scientific Informatics Education at Schools – Why Universities should Outreach to Schools

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Abstract. Due to the public awareness of digitalization of nearly all aspects of our life, emerged in many countries the need for a sustainable education of our youth in all aspects of ICT and informatics. The lack of already educated teachers and the missing of suitable subjects in the school curricula would need a strategy plan to overcome this situation. In this paper we describe a strategy how a university can support this movement to a profound informatics education at school. We started in January 2019 with a series of workshops for school classes with the aim to convey understanding of concepts of informatics to both teachers and students. We discuss the different goals of our outreach program and how we want to achieve them. As an example of our workshop activities we present the “Recurring Structures” activity that aims to learn the divide and conquer strategy.

Keywords : outreach program · informatics education · education achievements

Framework for ICT and Education Integration in Indian Secondary Schools

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Abstract. This symposium paper lays down the need of a Holistic framework for educators and policy makers to assess ICT tools and services that best suit to their teaching and learning arena in K-12 context. As digital determinism rises with more market interest in education technology, it is difficult for administrators, teachers and policy makers to make decisions on what technology tools and interventions are best suited for their learners, school and district-state needs and context. This holistic framework aims to provide a lens for the K-12 education stakeholders to make informed choice in making decisions regarding adoption and use of appropriate ICT tools and services, and also assess the value of their existing ICT tools and services. This framework was developed within the learning and experience of a large initiative in India called Integrated approach to Technology in Education (ITE). Drawing from the ITE framework, a team of practitioners, researchers and students working in the area of ICT in Education collaborated to expand and improve the ITE framework model in to a larger holistic model for ICT and Education. The holistic framework had 14 main categories, some of these main categories also had sub categories with series of relevant questions for different stakeholders (teachers, learners, designers, policy makers, developers, etc.). The main categories were: type of learning, role of teachers, role of technology, integration of the core subjects areas, integration of extra-curricular areas, use of digital open educational resources, context of the learners-authentic learning, type and design of content in the tool, digital agency for all teachers and learners, infrastructural access and challenges, and data collection. After development of the framework, three ICT interventions were chosen based on researchers/collaborators' access and familiarity to understand these interventions from the lens of the framework. This preliminary review of the framework suggested that overall the framework was exhaustive and useful to understand an ICT intervention holistically and addressed the needs and concerns of multiple stakeholders in the ICT and Education space in K-12. Other suggestions for improvement of the framework will be presented at the symposium

Keywords : ICT Framework ·ITE ·assessing ICT interventions in India ·ICT in K-12

A Mobile Application for Building Foundational Literacy Skills in India

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Abstract. Fluency Assessment and Benchmarking for Literacy in Education (FABLE) is the first mobile application (app) being developed for assessment of foundational English literacy skills in India. The probes are designed specifically for the Indian context and have been field-tested, statistically analyzed and leveled by grade. The primary objective is the quick and easy monitoring of student progress in reading based on automated analysis of quantitative and qualitative performance. The app allows for digital assessment and scoring of a student's oral reading fluency. It supports with analytics that help with interpretation of the score and well as guides teachers on how best to build an intervention plan. Efficient tracking of large student databases is made possible by the generation of detailed performance history including graphical visualization of trend data against grade level benchmarks. This will further support development of Indian benchmark levels based on locally normed student population.

Keywords : Digital · reading · assessment

Blended course for ICT Integration for teaching mathematics : Findings from design - based research in India

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Abstract. The paper presents the preliminary findings from a large-scale design-based research studying teachers' participation in a postgraduate certificate course in blended mode to meaningfully integrate ICT in their teaching. The extent and nature of teachers' participation in the face to face workshops, online course engagement and engagement in the mobile-based chat groups have been presented. The challenges faced by designers and teachers in sustaining the interactions in the distance mode through Telegram chat and course engagement as well as the challenges faced in using the student modules in schools are discussed. Implications for the macro-level structures and processes that need to be incorporated in the design to support successful ICT integration have been suggested.

Keywords : Design-based research · Blended mode · Teacher education · Mobile-based communities · ICT integrated teaching

Preliminary Learning and Teaching Outcomes of Project Based Learning with ICT

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Abstract. This paper presents preliminary findings and analysis of a large initiative called Integrated approach to Technology in Education (ITE), that is supported by Tata Trusts and resourced by Tata Institute of Social Sciences. It is a project-based learning using ICT where students create learning artefacts connected to subjects using ICT, and teachers design instruction by integrating ICT. The research under this initiative looks at the following three components: students' ability to perform on ITE projects, assessed by performance on ITE projects before and after 2 to 3 years of the intervention; learning skills as demonstrated in the ITE projects assessed on the rubrics developed for this purpose, and teachers' perspectives through interviews on usefulness of ITE approach in their classroom teaching and learning processes. Overall, the results seem to support impact of ITE on students' learning and teachers' pedagogy. Results indicate that about 2 to 3 years of exposure using ITE approach has enabled students to perform ITE tasks significantly better than before the ITE intervention. The rubric to assess ITE projects showed moderate internal consistency and can be reviewed further to improve internal consistency for wider dissemination across interventions using project-based learning. The ITE projects indicated above average ratings on three of the nine indicators on the rubric across the two states, and above average medians on most of the indicators for Assam based students. The teachers, master trainers and principal interviews indicated shift in pedagogy towards more activity-based learning due to ITE practice, making of lesson plans, and increase in students' interest and collaboration in ITE classrooms. Infrastructure challenges remained a concern at all levels but reports of teacher motivation for 'Bring Your Own Device and Resources' have been encouraging. Overall, the findings from these three categories need to be triangulated and further analyzed for making recommendations to ITE stakeholders.

Keywords : Project based learning with ICT · Impact of ICT interventions · ICT for marginalized sections in India

Relationship Between Demographic Factors and Teachers' Performance in a CPD Program

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Abstract. This paper presents a case of teachers' continuous professional development experience through a 4-month blended learning certificate course in ICT & Education by Tata Institute of Social Sciences for in-service teachers in upper primary and secondary government schools and madrasahs (an Arabic word for religious institution imparting Islamic and secular education). The paper reviews achievements of teachers in two courses that were conducted in the states of Assam and West Bengal in the year 2017. In the case of Assam, the course was pursued by government teachers from upper primary and secondary schools in rural Assam and DIET (District Institute for Education and Training) faculty members of the state. In the case of West Bengal, the course was completed by government teachers from upper primary and secondary schools in the city of Kolkata. The demographic and other technology use variables for the total number of teachers (74) and for the highest and lowest grade achieving teachers were analyzed. The paper also explored factors that predicted high performance (grades) among the teachers in the course using Regression analysis in SPSS. The demographic data showed that, the majority of the teachers in the data set lied between the age group of 30-49 years (47); 48 males and 26 females; 44 had B.Ed (Bachelor in Education) as a professional degree; majority of teachers had a teaching experience of more than 15 years (22) and 6-10 years (20); 58 were permanent teachers and 15 were contractual teachers. In the case of demographics of highest achievers (score nine out of 10), two out of three were in the age group of 25-29 years, and one in the age group of 30-39 years; two out of three were female teachers; only one out of three had completed B.Ed; all of them had less than 10 years of teaching experience; one was permanent and two other were contractual teachers. The lowest achievers were in the age group of above 50 years (1) and 30-39 years (2); all 3 were males with B.Ed as professional qualification; all 3 had varied teaching experience (above 15 years, 6-10 years and 1-2 years); all of them were permanent teachers. One of the notable observations in the demographic analysis was that although there were only 35 percent women teachers in the data set, two out of three highest achievers were women, and all three lowest achievers were men. More analysis in various categories of grades would throw more light on this finding. Regression analysis revealed certain ICT use related factors predicting performance among the teachers in the course, ($R^2 = 0.645$, $F = 3.150$, $P < 0.002$, $N = 74$); take clippings on mobile phones to show to students in class ($\beta = 0.507$, $p < 0.003$) predicted better grades. The analysis showed positive significant correlation between after course implementation of ICT integrated lesson plans and higher grades achieved by teachers ($r_s = 0.357$, $p < 0.002$).

Keywords : continuous professional development · Certificate in ICT & Education · demographic factors · teacher achievers

Education Technology @ CEIAR

ITE

(Integrated Approach to Technology in Education)

An Initiative of Tata Trusts

Resourced by: CEIAR, TISS

Objectives

- Bridge the digital divide and foster digital citizenship
- Improve learning and trigger higher order thinking skills
- Increase interest in learning and schooling
- Improve teaching pedagogy

Design

- Teachers design learning activities through lesson plans
- Students create learning artifacts with the help of technology
- Activities are integrated with the curriculum

Features and Adoption

- Student agency and creativity are central
- Language independent
- Works even in the remotest-needs basic infrastructure



Students

26,644

students have made ITE projects



Teachers

2917

teachers were trained by 149 master trainers, who took the certificate course in ICT and Education by TISS



Schools

1021

government schools (820 through master trainers), 66 learning centers and 34 madrasas reached to implement ITE



Milestones

2012
Piloted at Streets Survivors India, Murshidabad

2015
Scale up to government schools

2016
TISS, Mumbai as an academic partner

2018
Standardized rubrics for students projects evaluation

2013
Smart Partnership with existing partner NGOs

2015-16
First ITE mela by Suchana/First ITE camp by GVM

2017
First Certificate Course in ICT and Education with Assam government

2019
Documentation process started with ITE Case Study book



LeaP - Learners as Producers - ITE Symposium, New Delhi, Organised by CEIAR, TISS, 2019

Certificate in ICT & Education for teachers and teacher educators (C-03)

The Course Design-4 Months Blended Course

Face to face Mode (36 hours):

- Discussion on readings and practical issues on implementation, hands on activities to explore applications

Distance and implementation mode:

- 45 hours of implementation on ground and training others
- 60 hours of working on assignments and participating on whatsapp forming a community of practice and use moodle for assignments and reflections

Criteria for completion:

- Attend 100% F2F component
- Participate on online platform
- Completion of two assignments (graded): Lesson implementation in classroom with students in and handhold 12 to 15 teachers in the neighbourhood schools.
- Engage in Online reflections and quizzes (graded)
- Submit a digital portfolio synthesizing their learning and reflection in the course



5 courses

on Certificate in ICT & Education have been completed by **149 teachers in 3 states** and **96 training** were then conducted by these teachers with **2917 teachers** from **820 schools**

State Partners

SSA & SCERT, Assam

SSM Kolkata

West Bengal Board of Madrasah Education

Tibetan Central Administration



Students engaged in ITE activity with facilitator



Certificates being awarded to the teachers after completing the certificate course - ICT and Education

After the Certificate Course

Certificate course teachers representing on National Platforms

- National workshop on 'Computational Thinking and Problem Solving'
- State workshop for National ICT Award
- Tech4Transformation Conclave 2017, New Delhi

Continuous Professional Development Sessions are conducted with outreach teachers on ICT & Education & its implementation in schools

- Assam - 64 monthly meetings
- West Bengal - 26 monthly meetings
- 255 principals oriented for supporting CPD sessions



LeaP - Learners as Producers - ITE Symposium, New Delhi, Organised by CEIAR, TISS, 2019



OER Collaboration Award
for Excellence 2019



(Connected Learning Initiative)
(An initiative by Tata Trusts)



UNESCO King Hamad Bin
Isa Al-Khalifa Prize for the
use of ICTs in Education

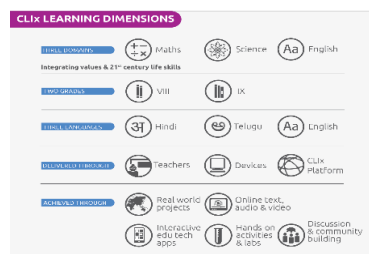
The Connected Learning Initiative (CLIX), a collaborative project that won UNESCO's prestigious **King Hamad Bin Isa Al-Khalifa Prize 2017 and OER Collaboration Award for Excellence 2019**. It is a multi-state, multi-partner initiative seeded by the Tata Trusts and led by Massachusetts Institute of Technology and Tata Institute of Social Sciences, CLIX has been working to improve teacher education and student learning through the use of ICT-enabled Open Education Resources (OER).

The initiative has partnered with the governments of **Rajasthan, Mizoram, Chhattisgarh and Telangana** to work in government high schools with students and teachers. It has also collaborated with a number of organisations for curriculum development and implementation. It has also collaborated with a number of organisations for curriculum development and implementation. These include Eklavya (Bhopal), Homi Bhabha Centre for Science Education (Mumbai), Mizoram University (Aizawl), Tata Institute of Fundamental Research (Mumbai), the National Institute of Advanced Studies (Bengaluru), State Council of Educational Research and Training (Raipur, Chhattisgarh), State Council of Educational Research and Training (Hyderabad Telangana) Tata ClassEdge (Mumbai), and the Inter-University Centre for Astronomy and Astrophysics (Pune).



CLIX offers high-quality interactive and technological enabled STEM (Science-Technology-Engineering-Mathematics) and Communicative English resources to secondary school students, professional development for their teachers and support to maintain and use ICT labs in schools. Teacher Professional Development is available through professional communities of practice and the blended Post

graduate Certificate programme in *Reflective Teaching with ICT*. Resources for students have been designed to be interactive, foster collaboration and integrate values and 21st century skills, aligned to the pedagogic vision of the National Curriculum Framework 2005. Currently, CLIX offers **15 modules** in **Digital Literacy, English, Mathematics, Science**, and **Values Education** in **English, Hindi and Telugu**, to **478 schools** in which ICT labs have been activated. **60,326** students in Grades 8 and 9 have benefited from the modules. **3509 teachers** have participated in Teacher Professional Development workshops and are on mobile-phone enabled Communities of Practice. All CLIX content is currently released under the **Creative Commons Licence 4.0**.



CLIX has converted the modules and other assets into Open Educational Resources (OERs) (<https://clixoer.tiss.edu>) that can be used, remix, modify and adapt and adopt to varied contexts. More than 100 hours of content in English, Hindi and Telugu languages with options for online and offline versions, more than 40 digital interactives and teacher support material will be available. In addition to the OER resources, the portal provides insights into the educational

design and development processes and the research that went into the creation of these high quality resources. These are of relevance to teachers, educators, students and policymakers. Recently concluded CLIX research shows significant learning gains in class IX students using ICT labs with CLIX resources and with teachers who have been part of the programme. The gains were significant for all, including girls, OBC and SC/ST students, where the access to ICT lab supports more active learning opportunities. Teachers have demonstrated improved ICT skills and positive beliefs about technology in education.

The Postgraduate Programme in Reflective Teaching with Information Communication Technology (RTICT)

The Postgraduate Programme in *Reflective Teaching with Information Communication Technology* (RTICT) is an initiative to develop a **community of practitioners** of teachers and teacher educators to connect with each other through pedagogic discussions rooted in teachers school contexts, experience and professional knowledge within a **TPACK framework**. As per the guidelines of the National Curriculum Framework (NCF 2005) and UNESCO Sustainable Development Goals, the need for the teacher to act as a facilitator of learning in a student-centered classroom that encourages collaboration, uses ICT tools, develops creativity and communication skills and creates a safe space for learning. These form the core of transfer of knowledge of the **21st century skills** that every child needs to acquire to be a successful, productive citizen of the world. The courses in the programme are offered in a blended or an online mode. The courses are hosted on an Open edX based MOOC platform, **TISSx**, and are also available on an Android-based app with the same name. Learners may choose to do **select standalone online courses** offered by the RTICT programme or earn a postgraduate certificate by completing the requisite courses worth 20 credits in all.

RTICT Programme Total: 20 credits	
Compulsory (4 Credits each) Total: 8 credits	E-03 Hands-on Learning through Toy-making
C-01 ICT and Education	E-04 Designing Learning Experiences for the English classroom
C-04 Action Research/Digital Portfolio	E-05 Assessment for Learning in Mathematics Education
Subject Specialisation (4 Credits each) Total: 4 credits	E-06 Teaching Literature: Strategies for Short Stories
S-01 Communicative English Language Teaching	E-07 Lesson Study based Professional Development for Mathematics Teachers
S-02 Reflective Mathematics Teaching	E-08 Mentoring for Teacher Professional Development
S-03 Interactive Science Teaching	E-09 The ICT Lab in School
S-04 Pedagogy of Social Sciences	E-10 The School Science Lab
S-05 Teaching Modern Indian Languages	E-11 The Nature of Science and Science Education
Electives (2 Credits each) Total: 8 Credits	E-12 Evaluation in ELT
E-01 Values Development in Adolescent	E-13 Teaching Mathematics and Science using Dynamic Mathematics Software
E-02 Using Media in the Classroom	E-14 Inclusive Education



Programme Objectives

- To develop one's practice as a reflective secondary school subject teacher
- To develop understanding and skills to nurture an interactive, active and inclusive classroom
- To develop critical perspective, understanding and skills of ICT use for professional development and teaching-learning
- To develop specialised additional skills relevant to secondary school students and teaching
- To become an active member and participant of a community of professional

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