EDUsummIT 2015 Summary Report
TECHNOLOGY ADVANCED QUALITY LEARNING FOR ALL

EDUsummIT 2015 Summary Report

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Acknowledgement
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A Sketch of EDUsummIT in Bangkok

Kwok-Wing Lai, University of Otago

About EDUsummIT

This ebook is a collection of summary reports of the thematic working groups (TWGs) of EDUsummIT 2015. EDUsummIT (International Summit on ICT in Education) is a global knowledge building community of researchers, educational practitioners, and policy makers committed to supporting the effective integration of research and practice in the field of ICT in education. EDUsummIT was founded in 2009 to extend and further develop the work undertaken by the authors of the International Handbook of Information Technology in Primary and Secondary Education, edited by Joke Voogt and Gerald Knezek (2008). Since its inception, EDUsummIT has been held four times, firstly in the Hague (2009), then Paris (2011), Washington D.C. (2013), and most recently, in Bangkok (2015). Between 70 and 140 participants from six continents have attended EDUsummIT meetings. While EDUsummIT participants meet biennially, thematic groups focusing on pertinent research topics in ICT and education are formed prior to EDUsummIT to prepare discussion papers. These papers are further developed during EDUsummIT. After each EDUsummIT, TWG findings are published in international journals and presented at major conferences.

EDUsummITs are organised in association with international and national organisations actively supporting the use of information technology in education. These organisations include the Society for Information Technology and Teacher Education (SITE), the International Society for Technology in Education (ISTE), Kennisnet (Netherlands), the International Federation for Information Processing (IFIP) Working Group 3.3 (Research into Educational Applications of Information Technologies), the Association of Teacher Educators (ATE), the Teacher Development and Higher Education Division at UNESCO, and UNESCO Bangkok.

EDUsummIT 2015

EDUsummIT 2015 was co-hosted by UNESCO Bangkok (the Asia and Pacific regional bureau of UNESCO) and Curtin University, and sponsored by Blackboard. The theme of EDUsummIT 2015, Technology Advanced Quality Learning For All, had a special focus on the integration of digital technologies in education in Asia-Pacific countries. Several UNESCO Bangkok ICT specialists joined the TWGs as policy advisors.

David Gibson (Curtin University) and Kwok-Wing Lai (University of Otago) co-chaired EDUsummIT 2015, and a steering committee (refer Appendix 1) was set up to oversee its operation. Planning began in May 2014, with its first meeting hosted by the University of Canterbury, New Zealand. The second meeting was a site visit in Bangkok, hosted by UNESCO Bangkok in October 2014. The third meeting was a TWG leaders’ meeting, which was held at the SITE conference in Las Vegas in March 2015. The planning committee communicated regularly with TWG leaders via email and video-conferencing.
A Google community was set up for leaders to discuss EDUsummIT business and a website (http://www.curtin.edu.au/edusummit/) was created to publicise EDUsummIT 2015 and archive its documents.

Nine thematic working groups (TWG) were formed in the beginning of 2015 (refer Appendix 2 for a list of participants). These groups included:

**TWG1:** Smart partnerships  
**TWG2:** Advancing mobile learning in formal and informal settings  
**TWG3:** Professional development for policy makers, school leaders and teachers  
**TWG4:** Addressing gaps and promoting educational equity  
**TWG5:** Assessment as, for, and of learning in the 21st century  
**TWG6:** Creativity in a technology enhanced curriculum  
**TWG7:** Indicators of quality technology-enhanced teaching and learning  
**TWG8:** Digital citizenship and cyberwellness  
**TWG9:** Curriculum - advancing understanding of the roles of CS/Informatics in the curriculum

Focusing on their respective themes, the TWGs started researching and developing their discussion and policy papers from February 2015. The TWGs were guided by the following questions:

- Why is this theme important to education and learning?  
- What are the key issues and questions to be addressed?  
- What are the research, policy, and practice challenges faced and what are your recommendations to help researchers, practitioners, and policy makers to move forward?

The TWGs were also asked to:

- Conduct a synthesis of relevant research related to the theme’s topic.  
- Provide examples of innovative practices and if possible, include Asian-Pacific examples.

TWGs used a variety of technologies (e.g., Google Docs and Sites) to support pre-Bangkok discussions. Drafts of the discussion and policy papers were prepared before the Summit. TWG leaders also prepared questions for discussions, with supporting materials (research articles, reports, website links, etc.).

A ministerial-level forum on ICT in education (the Asia Pacific Ministerial Forum of ICT in Education (AMFIE)) was to be held immediately after EDUsummIT 2015. The TWG policy papers were to be distributed and used at the Forum. Due to unforeseeable reasons however, AMFIE had to be postponed until 2016, but the TWG policy briefs will be published by UNESCO Bangkok and distributed at the forthcoming AMFIE. Findings from TWGs 7 and 8 will also be presented at AMFIE.
EDUsummIT in Bangkok

Close to 90 researchers, policy makers, and educational practitioners attended EDUsummIT 2015 in Bangkok (plus over 40 participants not able to attend). These participants came from 35 countries. All TWG leaders and steering committee members met a day before the Summit, on September 13 (refer Appendix 3 for the full programme). On the morning of Monday September 14th, Dr Gwang-Jo Kim (Director, UNESCO Bangkok) and Professor Jill Downie (Deputy Vice-Chancellor Education, Curtin University) welcomed EDUsummIT 2015 participants, and Dr Jonghwi Park (UNESCO Bangkok), Professor Joke Voogt (University of Amsterdam) and Professor Gerald Knezek (University of North Texas) delivered the keynote addresses.

During the two full-day meeting, EDUsummIT 2015 participants engaged in intense discussions of key issues and challenges related to TWG themes, and developed recommendations and action plans. There were five group sessions, lasting one and a half hours each. An additional session was also held to provide “cross-fertilisation” between groups, with TWG leaders visiting other groups to share their findings and elicit feedback. A plenary session was held before closing when TWG leaders reported group findings to all participants.

TWG summary reports

In the following TWG reports, each group has summarised the background and context of its theme of study, the issues and challenges, recommendations they proposed to researchers, policy makers and educational practitioners, and the action plan to move forward. A dominant theme that emerged from the recommendations of the TWGs is, to be successful and effective in integrating information technology in education, teachers and educational practitioners need to be well-supported with teaching, learning, and assessment materials and tools, as well as professional learning and development opportunities. They also need to understand the complexity of integrating technologies in teaching and learning, while not losing focus on the learners and learning outcomes, across a range of formal and informal learning situations and contexts.

Looking ahead

The policy briefs prepared by the TWGs will be published by UNESCO (edited by Jonghwi Park and David Gibson). Research papers developed by the TWGs will also be published as a special issue in the Journal of Educational Technology & Society (edited by Joke Voogt and Gerald Knezek).

The next EDUsummIT will be held in Borovets, Bulgaria, in September 2017. It will be co-chaired by Petra Fisser (Netherlands Institute for Curriculum Development) and Roumen Nikolov (University of Library Studies and Information Technologies, Sofia). A steering committee (Joke Voogt, chair, Margaret Cox, David Gibson, Gerald Knezek, and Kwok-Wing Lai) has been formed to support the co-chairs. The planning process will begin in 2016.
The EDUsummIT knowledge building community continues on in 2017...

Reference

Background and context
As part of its commitment towards inclusive and equitable quality education and lifelong learning for all, UNESCO (2015) has recognised the need for Smart Partnerships among education stakeholders “to create equitable, dynamic, accountable and sustainable learner-centred digital learning ecosystems” (Incheon Declaration). In line with its 2030 education agenda, UNESCO also calls for further consultation and dialogue between governments and the private sector to design scalable innovative funding mechanisms that will secure the financial resources needed to unleash the full potential of digital technologies and ICT for learning in the Qingdao Declaration.

Despite such widespread agreement on the need for Smart Partnerships in education, the working group found little research on such practices. As a consequence, identifying a Smart Partnership was a core challenge that needed to be addressed. For this reason, this EDUsummiIT working group (TGW1) accepted UNESCO Bangkok’s invitation to respond to the request of the Asia-Pacific Ministerial Forum on ICT in Education (AMFIE) for a brief on research into Smart Partnerships and they began to gather potential exemplars as part of a white paper on ICT infrastructure for schooling commissioned by UNESCO Institute of Statistics (Twining, Davis, & Charania et al., 2015).
**What are Smart Partnerships?**

Therefore, the most important activity at the EDUsummIT in Bangkok was for this group to identify what makes a Smart Partnership. This was done as follows,

Multi-stakeholder partnerships become Smart Partnerships in education when they:

1. include partners within and across education (including teachers, their organisations, and researchers), government (of education, commerce & law enforcement etc.), industry, communities, and civil society (e.g. NGOs)
2. have a shared purpose (values, concept vision) that evolves into a synergy (more than a sum of the parts)
3. have a strategic and holistic approach
4. enhance the quality of education with digital technologies (ICT)
5. harness ICT smartly (e.g. evidence immediately deployed to improve performance)
6. recognise their role in the emergent process(es); and
7. facilitate their own organisations to change.

While it is possible to have a Smart Partnership with a small scope, a large initiative to enhance the quality of education with digital technologies (ICT) for a region is more likely to be sustained with a Smart Partnership that encompasses all seven characteristics listed above. A Smart Partnership may include one or more smaller Smart Partnership(s) within it.

Some better known Smart Partnerships may be very limited in the synergy achieved with respect to UNESCO’s vision and the needs of the Asia Pacific region. For example, IBM’s Smart Partnerships projects, which include case studies in education, are considered by IBM to be ‘smart’ due to the way in which they harness Learning Analytics (see characteristic 5 above). However, where only that one characteristic is deployed, the ‘smart’ nature of the partnership is very limited. An interesting example that we hope to explore further is the “Flemish Ministry of Education Easy access to educational analytics with a single portal for 4,000 schools” (see IBM Business Analytics, n.d.). We also recognise the relevance of Grobe’s (1990) analysis of industry-education partnerships through which developed a series of three typologies that is useful because it describes true partnerships, as opposed to more one-off interactions. Grobe’s three types of industry-education partnerships are (1) levels of involvement that also describes the maturing as partners engage more deeply with one another, (2) the partnership structure, and (3) the level of impact of the partnership on the education system.

An important outcome of the EDUsummIT in Bangkok is therefore the recognition of the importance of all six aspects of Smart Partnerships listed above. These will be developed further into a definition in the TGW1 Policy Brief on Smart Partnerships for wider dissemination.
Illustrations of Smart Partnerships

The working group also applied Davis Arena of Change with Digital Technologies in Education (Davis, 2015) to begin to analyse and describe two Smart Partnerships, one to reach remote and underserved populations in India and the other a nationwide Virtual Learning Environment being deployed in Malaysia. In India, the Integrated approach to Technology in Education (ITE) is an initiative of the Tata Trusts in twelve mostly rural locations in Eastern and northern India. Amina Charania was the key informant. The ITE approach is a largely constructivist pedagogical framework to improve teaching and learning processes and foster authentic and project based learning for the older children and adolescents in some of the most underprivileged geographies in India. Students, mostly first time computer users, create learning artifacts to deepen their and peers’ learning of content, such as weather charts, graphics of jute production in India, or compare population density in cities. All the projects assigned are carefully selected by the teachers and match with the curriculum and lessons currently taught in the school. The projects initiated with an existing partnership between the organizations and the Trust. In this case, the Trust conceptualized the program, approached the organizations who were working with adolescents through learning centres (see Charania, 2015, pp. 64-67). Figure 1 is a photograph of this Indian ITE Smart Partnership that was sketched in The Arena, with a Teacher at the centre who is located in a school and complemented by a teacher working as an ICT Facilitator located in a Learning Centre in the community.

![Figure 1](image.jpg)

*Figure 1. A photograph of an Indian Smart Partnership that was sketched by Niki Davis with TGW1 during EDUsummIT in the Arena, with a teacher at the centre who is located in a school and complemented by a teacher working as an ICT facilitator located in a learning centre in the community. Amina Charania was the key informant.*
Hasniza Nordin from Malaysia was the key informant for our second illustration of a Smart Partnership. In Malaysia in 2014, 12 Junior Science College known as Maktab Rendah Sains (MRSM) governed by a branch of the Ministry of Education (MARA) that were selected for an innovative approach to schooling called “Learning Powered by Technology”, through which the partners align concepts such as the Malaysian Smart School and the Malaysian Ministry of Education’s Blueprint (2013-2025). The strategy is to lead with the content and pedagogy aspects with the use of digital technologies and nationwide online platform (see Nordin & Davis, 2015, pp.72-74). The partners hold complementary responsibilities in order to successfully integrate this approach to teaching and learning and blended online environment. In this Smart Partnership, (1) MARA plays a role of the main provider; (2) the national Telecom™ company and Microsoft™ with its global reach provide the technology facilities for the 12 regional centres (MRSM); and (3) MSRM provide professional development throughout Malaysia in collaboration with Content Capital and university teacher educators, including Hasniza Nordin, Universiti Utara Malaysia. Figure 2 is a photograph of this Malaysian focused Smart Partnership sketched by TGW1 on The Arena during the EDUsummIT, with a teacher in one classroom of one of the MRSM at the centre.

Figure 2. A photograph of a potential Malaysian Smart Partnership sketched by Niki Davis with TGW1 on the Arena during EDUsummIT, with a teacher at the centre in one classroom of one of the partner schools, with other school’s classrooms behind her. The key informant was Hasniza Nordin.
Challenges

The following challenges were recognised by TGW1:

- Develop a shared understanding/definition of SMART PARTNERSHIPS.
- Identification of which stakeholders should be involved in the partnership i.e. who should be involved to ensure that the partnership is complete?
- Ensuring the participation of all stakeholders
  - How to encourage/motivate business partners into areas in which they have no presence? e.g. rural, remote areas, out-of-school organisations etc.
  - How to promote the ‘buy in’ of educators and other stakeholders?
- Tension in developing a shared vision, trust & respect across & between partners.
- Power issues: development of distributed ownership and responsibility across partners.
- Engagement of sufficient numbers of educators to ensure sustainability.
- How to gather convincing evidence that illustrates a successful partnership?
- What indicators are helpful in evaluating progress in projects?
- How to harness ICT ‘smartly’ to gather evidence, to provide immediate feedback and to communicate
- Deepen understanding of scalability and smart partnerships.

Recommendations

The following recommendations were made to address a variety of stakeholders including researchers, policy makers, and educational practitioners:

- Develop and communicate a shared understanding of Smart Partnership.
- More research on Smart Partnerships should be commissioned.
  - Particularly in the Asia Pacific region.
  - Develop robust indicators for effective smart partnerships.
  - Develop more robust indicators for learning outcomes resulting from Smart Partnerships.
- Smart Partnerships should be comprehensive and be inclusive of communities and context (i.e., move beyond education systems).
- Smart Partnerships need smart communication strategies; attention should be paid to this from the outset.
- Additional incentives required when the business case is not clear for all parties (e.g., rural/remote areas, marginalised learners).
- UNESCO and EDUsumIT participants should advocate for:
  - Capacity building to increase the number and sustainability of smart partnerships
  - Capacity building for smart ICT use (e.g., access to big data).
  - Smart Partnerships where scalability is necessary.
TGW1 Action Plan

This report concludes with an action plan that takes our work into the future. It begins with actions taken during the EDUSummiT TGW1 made progress with its action plan. As described in the first section of this report the characteristics of Smart Partnerships were agreed and two examples were mapped on Davis’ Arena to illustrate the scope of the partnership from local to global (see Figures 1 and 2).

Following the meeting in Bangkok the group agreed to undertake the following actions (with leaders identified by their initials):

- Develop policy paper and ways to disseminate it in the Asia-Pacific region, such as Ministerial Forum on ICT in Education (AMFIE). (AM, ND, HN & all)
- Discussion paper on Smart Partnerships developed for special issue. (ML & all)
- Research paper Indian Smart Partnership for special issue. (AC & ND)
- EDUSummiT 2017 TWG on organisational change/evolution. (ND & DO)
- Contribute to UNESCO for policy makers, e.g., AMFIE, RDTC. (ND & HN)
- Symposium for IFIP TC3 conference July 2016 in Portugal. (CL, ND)
- Develop research bibliography in Google doc etc. (ND and all)
- Map a range of Smart Partnerships using Davis’ Arena (ND, AS, DO, HN)

Finally, we would like to note that the work of most of the other TGWs have agenda that link with TGW1: Smart Partnerships, but few of them recognised this at the time of the plenary in the second and final day of EDUSummiT in Bangkok. The four TWGs that are likely to find greater relevance of Smart Partnerships with their topics are recommended to consider this aspect within their work. They are:

- TGW4: Addressing gaps & promoting educational equity;
- TGW7: Indicators of quality technology-enhanced learning and teaching;
- TGW8: Digital citizenship and cyberwellness;
- TGW9: Curriculum - Advancing understanding of the roles of Computer Science/Informatics in the curriculum.

References

Note: The references are included as links, including the following key items:


Thematic Working Group 2

Advancing Mobile Learning in Formal and Informal Settings

Summary Report

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With

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Introduction

During the Fourth International Summit on ICT in Education (EDUsummIT, 2015) which was held in Bangkok, Thailand, members of the Thematic Working Group 2 (TWG2) discussed methods, strategies, and guidelines for some of the issues and challenges in the design, implementation, evaluation, and policy development of mobile learning. Some major key challenges were highlighted and discussed along with issues that policy makers, teachers, researchers, and students are facing in mobile learning. Based on the outcome from the framework that identified barriers and limitations along with dynamic criteria for mobile learning implementation, which was the outcome of TWG2 from the EDUsummIT 2013 (Khaddage et. al., 2015), the group briefly summed up major challenges and identified possible solutions that could be applied to solve these challenges.

The implemented framework classified challenges into four categories: Pedagogical challenges, technological challenges, policy challenges and research challenges. Any new technology leads to new pedagogies, new policy and new research; these four factors combined can form a solid infrastructure that may help adopt effective ways of mobile learning application (refer Khaddage et. al., 2015 to read more about the model). All evolutionary change usually takes place in response to ecological interactions that operate on the overall ecosystem, and in this case the interaction is obvious between
these four challenges and they can allow the understanding of the structure and function of each one of them. Understanding the relationships between these challenges are essential for a proper mobile learning integration and a successful mobile learning ecology (Zhao & Frank, 2003).

Mobile learning as a concept and theory has evolved rapidly, it is no longer considered technocentric (devices and technologies), it is more about the learner’s mobility and how we as educators can engage them in learning activities without them being wirely restricted to a physical location. Hence comes the challenge of finding appropriate and effective methods to blend formal and informal learning as seamless learning can occur anytime, (formal in-classroom, or informal outside classroom).

Background

New technological innovations always bring along great passion and open up enormous possible educational applications and opportunity. This is not new as this has been the case for so many decades. In 1913, when film was first used in instruction, Thomas Edison was optimistic of the potential that this could bring to education and he claimed then that “the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks” (Cuban, 1986, p. 9), although instructional films did contribute a great deal in some military training, (Noble, 1991) but films have never replaced the traditional book. These days some would argue that technologists are very optimistic about the capability of technologies and they think of it as a replacement to the existing methods and current trends, but is this shift about the technology or the curriculum? Are technology and education becoming inseparable?

So far, it is apparent that despite the results presented from so many research studies such as Ooms, Linsey, Webb, and Panayiotidis (2008) and many more, the infusion of mobile technologies into educational setting has not been widely adapted yet. Many teachers in schools and colleges are still reluctant to allow widespread access to these devices in a formal classroom setting (Khaddage et. al., 2009). This has resulted in many students being bored in classrooms and added to the already high dropout rate. Others may simply not pay attention during class time, adding to poor performance. Many students feel that the materials provided are somehow irrelevant for them, not engaging and don’t satisfy their needs, as these materials are out-dated and do not fit into today’s society (Khaddage, et al., 2012; Knezek, et al., 2011).

While Web 2.0 (e.g., SMS, Twitter) supports asynchronous collaboration, the emerging Social 3.0 apps (e.g., Google Docs Editor) support synchronous collaboration. Upon reflection this is not surprising but schools (read: teachers) don’t really care about synchronous collaboration technology; they care about the pedagogical impact of the technology, e.g., facilitating social learning. The question remains: when mobile learning will come into the primary/secondary classrooms and become a valuable component of the curriculum? Neither the iPads nor the Chromebooks support all-the-time, everywhere learning. Do Smartphones? Is mobile learning finally poised to make the level of impact on teaching and learning that mobility is having on most other areas of human endeavour? With the rise of the Internet of Things (IoT), the scope of mLearning is poised to be redefined in a very significant way – wearable devices and IoT
interactions introduce a whole raft of new considerations, and all of these combined poise challenges on informal learning, these challenges are summarised and illustrated in Figure 1.

Key Challenges for Informal Learning

Figure 1. Key challenges facing informal learning.

Recommendations and Possible Solutions

Acknowledging informal learning is still the biggest challenge faced by educational institutions. Valuing informal learning should be considered crucial element to consider when developing educational policies. So far only few countries such as South Africa and Ireland award qualifications based on knowledge gained via informal learning, and the rest still have no formal policy framework for this type of learning (Werquin, 2010). Making informal learning a valued and visible component of the education system is very important, and that was the main challenge that group TWG2 discussed during EDUsummit. Educational institutions should re-evaluate the current educational framework and decide on how to fit in seamlessly informal learning. Informal learning should be embedded in educational contexts by training teachers via professional development on how to help learners know how to share knowledge gained through informal learning activities and tasks, and let them see the potential of this sharing and collaboration activities amongst learners. This may help to broaden the acceptance of this type of learning. Figure 2 is a self-explanatory illustration of possible solutions to the identified challenges.
Innovative Practices and Future Considerations

When it comes to design challenges of mobile learning, leading mobile apps are delivering exceptional user experiences (UXs) achieved with a variety of techniques including motivational design, "quiet" design, "playful" interfaces and new methodological approaches (Gartner, 2015). Designers are also creating apps that can accommodate mobile challenges, such as partial user attention and interruption, or exploit technologies with novel features in an attempt to hook the learner into using the technology to complete the learning task. A good example of this is augmented reality.

According to Gartner (2015), by the year 2020 an affluent household will contain several hundred smart objects, including domestic appliances, sports equipment, medical devices and controllable power sockets etc. These domestic smart mobile objects will be a part of the Internet of Things (IoT), and the majority of them will be able to communicate in some way with an app on a smartphone or tablet. Smartphones and tablets will perform many functions, including acting as remote controls, displaying and analysing information, interfacing to social networks to monitor "things" that can tweet or post for learning activities and tasks informally. This combination of smart objects and mobile apps and technologies will enable an even wider range of learning opportunities (Gartner, 2015).

So far only a small number of smart objects and appliances are available in 2014 such as sensors, the range of domestic smart objects will continue to grow and how this will affect the learning environment in an informal settings is quite still not clear. On the other hand cellular technologies such as LTE and LTE-A can improve spectral efficiency and will push cellular networks to theoretical peak downlink speeds of up to 1 Gbps (GigaBits per second). Additional benefits include reduced latency. LTE is already partially deployed in many countries. A few LTE-A trials have been conducted at the end of 2013. Once deployment of a technology such as LTE or LTE-A starts, it typically takes seven to 10 years to achieve nationwide coverage and user adoption. All users of cellular data benefit from improved bandwidth reduced latency and increased capacity. Applications that demand high-speed real-time data such as streaming video will benefit substantially; so, for example, LTE is allowing some cellular networks to compete with satellite data for broadcasting applications and this will definitely improve mobile accessibility for learning content.
New technologies bring along new issues, wearable technologies such as watches displaying email and messages will pose new security and management challenges. Devices that can record video will raise many privacy concerns, as has been demonstrated by Google Glass. Educational institutions are still fretting about mobile learning (policies as well as pedagogies, research and technologies) and struggling to find ways of proper integration. Hopefully the provided solution if delivered properly may help in solving the identified key challenges and help in preparing education institutions in finding unique approaches to blend informal learning seamlessly into their existing setting.

**Action Plan**

- Develop a policy paper for UNESCO by 31 of October 2015.
- Finalize a discussion paper and submit by 15 of November 2015.
- Provide a journal article on mobile learning based on TWG2 work at EDUsummIT by February 2016.
- Submit an AERA/WERA proposal to present findings and outcomes from TWG2.
- Provide paper on mobile learning for Refugees “Food, Water and Sim Cards” to be presented at UNESCO during the Mobile Learning Week, on March 2016.
- Continue our [Professional Learning Network](#) on mobile learning and informal education.
- Share out results locally and internationally via presentations and publications.

**Conclusion and future work**

When blending formal and informal learning, educational institutions should not be aiming to unintentionally formalize informal learning, but rather they should be looking to find new and unique methods and approaches to incorporate it and blend it seamlessly into their settings. While there are potentials with informal learning and particularly in low resource context, more research needed to be done to further understand this shift in technology and in educational settings (formally and informally). More funding for informal learning initiatives should be made available in order for educators, researcher, policy makers and practitioners to highlight the value and benefits of this type of learning. The continues and consistent work of TWG2 via the application of the mobile learning framework see (Khaddage et. al., 2015), and the presented challenges are considered useful techniques that can be used to test the ecological theory in the mobile learning framework, hence assisting researchers, policy makers and educators in the practical implementation within the mobile learning environment.

**References**


Thematic Working Group 3

Professional development for policy makers, school leaders and teachers

Summary Report

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John Wilson, Burapha University

Background and context

Continuing professional development for all actors at all stages is critically important if education is to be transformed through the application of information and communication technologies (ICT) (Voogt & Knezek, 2008). Successive EDUsummIT meetings have included working groups on teacher professional development (TPD) for the application of ICT in education, thereby recognizing the importance of effective TPD for successful implementation of ICT into the education system at all levels, from preschool through secondary schools, to higher education and teacher education. Nevertheless, there remains much work to be done to ensure that TPD meets the needs of teachers across a wide variety of contexts and cultures.

Lack of suitable professional development may exacerbate the digital divide between and within countries and even within individual schools (Anderson, 2010) if it results in ineffective application of ICT (OECD, 2015). Still, although, access to ICT is a prerequisite, it does not inevitably bring about ‘better’ learning outcomes. It remains true that what teachers do with whatever (little) ICT is available has greater impact on learning than the mere presence of ICT.

Development of an appropriate ICT Competency Framework for Teachers may assist countries to develop effective policies and standards within a master plan for ICT in education (UNESCO, 2011). EDUsummIT 2011 highlighted the importance of achieving a shared vision of ICT implementation and supporting its realisation by engaging all stakeholders in decisions about TPD, promoting networks and communities for TPD, and
including ICT as an integral component of TPD (Twining, Raffaghelli, Albion, & Knezek, 2013). Following EDUsummIT 2013, a conceptual model linking research with practice was developed with illustrative cases of key principles applied in different parts of the world (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015). The main themes addressed during EDUsummIT 2015 were: (1) the importance of contextualization; (2) the challenge of sustainable and scalable TPD; (3) the question how to link TPD for ICT integration to educational innovation; and (4) systemic and systematic TPD. Finally, TWG3 also introduced a new concept in this field: 5) technology discernment.

Issues and challenges

Based on the paper prepared in advance of EDUsummIT 2015 and discussions during the meeting, the following are proposed as issues and challenges for teacher professional development that should inform the work of policymakers and leaders within the education system.

i. Contextualization: sociocultural awareness, digital diversity and equity

Technology enables us to create, collect, store and use information; to connect with people and resources all over the world; to collaborate in creating knowledge; and to distribute and benefit from knowledge products (OECD, 2015). However, many people lack access to ICT, resulting in a new form of exclusion often described as the ‘digital divide’. Lack of access to the Internet is one of the most damaging forms of exclusion (Tondeur, Sinnaeve, van Houtte, & van Braak, 2011; Van Dijk, 2006).

Globalisation of the economy should not imply homogenisation of culture. PD in support of ICT application in education should be both sensitive to, and enabling of, differences in historic, social, cultural, economic, and political contexts. Technology integration is also influenced by specific school cultures that require careful alignment of content and pedagogical knowledge. These differences should be seen as assets within PD.

ii. Sustainability and scalability of PD

Providing continuing PD about ICT implementation in education to all who need it is challenging because of the large numbers to be reached and the need for frequent updates in response to developments in ICT. Sustainability, meaning regular and long-lasting renewal and efficient use of available resources, and scalability, meaning capacity to reach all and disseminate ideas, are key characteristics for success. Ministries of Education as well as colleges of education increasingly acknowledge the need to offer generic professional development programs that meet the needs of education in a technology savvy context, thereby ensuring long-lasting impact on education outcomes.

Working with teachers to develop their knowledge, beliefs, and attitudes can build a sustainable culture that supports ICT as integral to learning and teaching (Ertmer & Ottenbreit-Leftwich, 2010). Group members agreed that professional development should be conducted using advanced ICT tools, platforms and online environments, to support professional learning about emerging ICT and new forms of literacies. Hence, we identified the value of enabling teachers to share their ideas and provide examples of their good practices so that, through this process of understanding, sharing and negotiating, these new practices can be transferred into local settings (Prestridge, 2015).
In this fashion, an enabling model is preferred where teachers are providing and negotiating the ‘good practices’ to be appropriated rather than a ‘deficit model’ that imposes the ‘good practices’ identified by some central authority. Opportunities for TPD available through online communities of practice, social networking and online environments can provide both sustainable and scalable outcomes across geographical and cultural contexts.

Barriers for scaling and sustaining PD include social and cultural factors, lack of teachers’ TPCK, inadequate infrastructure, limitations of Internet diffusion, linguistic differences, and geographical separation (Edirisinghe, 2015). These factors are mutually dependent. Models of ongoing lifelong learning or continuous professional development should be built in ways that support implementation across diverse settings, thereby allowing for scalability and sustainability (Ellaway, 2013).

iii. Empower pedagogy through ICT

Members concurred that the role of education is the advancement of society, which can be achieved only by endorsing a culture of transformation, innovation and entrepreneurship. Supporting the effective application of ICT to enhance learning and teaching in novel ways may serve as a foundation for successful TPD, and vice versa - utilizing ICT in novel ways within TPD may facilitate innovative pedagogical practices, that will, in turn, send to practice innovative teachers who may affect the education system as a whole, thereby leveraging efforts in the field and establishing Professional Development 2.0 (Archambault, Wetzel, Foulger, & Kim Williams, 2010; Prestridge & Tondeur, 2015). Education evolves in parallel with innovative pedagogical practices using technology so that novel ICT-empowered pedagogies are emerging constantly. These include new approaches to content delivery and merging of content from different disciplines, which may in turn create a new curriculum. In short, what is expected of the TPD process (effective application of ICT to enhance learning and teaching), is not simply to be a process of transformation and/or innovation but a process of social change in the transaction of pedagogy and content; it is assumed that “history is on the side of change” (Cobb, 2007, p. 14).

iv. Systemic and systematic PD

Professional development of teachers requires a lifelong learning approach, beginning with pre-service teacher education programs, and continuing throughout their professional lifespan. During the discussions, several projects were showcased addressing the importance of systemic approaches to change. In this respect, effective preparation of pre-service teachers for technology integration requires attention to: (1) all the stakeholders at different levels in the education system; and (2) local factors (cultural and structural), but also demands similar attention toward the relationships between the themes (Kay, 2006; Mioduser, Nachmias, Tubin, & Forkosh-Baruch, 2002; Tondeur et al., 2012).

At the same time several TWG3 members stressed the importance of systematic (gradual and evolving) change efforts. This aligns with the results of Seels, Campbell, and Talsma (2003) who concluded that it would take a long period with constant reiterations to see substantial change in technology integration (see also Albion et al., 2015; Tondeur et al., 2015). Underpinning this conclusion is the understanding that teacher
participation in the learning ‘process’ and the development of learner autonomy (and self-regulation especially online) are considered outcomes of professional development (Prestridge & Tondeur, 2015). Systematic PD also refers to the need for lifelong professional processes.

v. Technology discernment

Educational decision makers—whether teachers, principals or policy-makers—have to make wise decisions about the selection and deployment of ICT and about the content and delivery of PD to support application of ICT in order to ensure that the outcomes are enhanced education for all. Critical analysis of available data may not necessarily lead to a clear decision and may need an additional perceptive judgment, “psychological or moral in nature,” (“Discernment,” 2015, para 1) called discernment.

Trauffer (2008) asserts that “discernment represents a multidimensional concept of decision making by logic and reason, by empathy gained through understanding, and by moral ethics” (p. 13). Terming discernment as a “21st century decision making model,” Trauffer (2008) further explains discernment as “the ability to regulate one's thinking in the acquisition and application of knowledge to make decisions that are right, fair, and just.” This notion of discernment is more than simple critical thinking required of an educational leader when deciding about the technological inputs—whether hardware, software, process or procedure, and can be described as technology discernment. The power of discernment when specifically applied to the choice of technology in the form of products, services or processes involved in the TPD, can ensure the real working needs of the TPD participants are met and thus keep them engaged and motivated in a sustainable manner.

Recommendations

Discussions within the group produced a set of recommendations directed to assisting policymakers and principals, as educational leaders, to disseminate effective TPD related to technology implementation.

Policymakers are encouraged to:

i. engage the widest possible range of stakeholders in education systems for TPD in the needs assessment, choice and application of ICT to learning;

ii. recognise that deployment of ICT alone is not sufficient but that teachers are necessary and active contributors to the design of good practice, in addition to other contributors including ministries, NGOs and the commercial sector;

iii. encourage networks and communities of support among teachers, support the development of a synergistic ecosystem and the use of open education resources (OER), and promote lessons learned for broader adoption;

iv. distribute findings of action and design research about the use of ICT in education from individual teachers, schools, academia, and ministries;

v. identify a set of required ICT competencies for teachers and consider the possible role of such competencies in re-certification of teachers; and

vi. update educational policy related to PD focused on ICT and create a continuum of pre- and in-service PD focused on ICT.
In addition, principals are encouraged to:

i. consider how teachers’ beliefs about learning influence their application of ICT for teaching;
ii. engage teachers to persuade them of the need for pedagogical change and match to PD with immediate practical application;
iii. document and disseminate good practices;
iv. conduct PD in practice-based environments, encouraging teachers to utilise available ICT facilities; and
v. decentralise classrooms by leveraging online social networks for sharing and negotiation of good practice.

Action plan
Discussion within TWG3 resulted in proposals for several actions to follow from EDUsummIT 2015 and extend its influence. They include several publications with focus on both scholarly and policy matters in order to build bridges between policy, research and practice. Specific plans include:

i. Three scholarly papers targeted initially for the proposed special issue of the Journal of Educational Technology & Society on these topics:
   a. Technological Pedagogical Content Knowledge (TPCK) and Professional Development
   b. Professional Development, technology discernment, and sustainability
   c. Challenges and models for professional development relative to ICT
ii. Policy paper to contribute to development of a policy document by UNESCO
iii. This summary document for the e-book that will be published on the EDUsummIT website
iv. Conference presentations: All India Association for Educational Research (AIAER), Thiruvananthapuram, India; Society for Information Technology and Teacher Education (SITE 2016); Australian Council for Computers in Education (ACCE 2016); European Association for Research on Learning and Instruction (EARLI 2017) - still under examination.

References


**Introduction**

The integration of digital technology into teaching and learning is a double-edged challenge. While online distance education increases access without borders to a variety of subject and topic contents, onsite formal education is facing rising expectations regarding the practices and nature of methodology. Educational equity remains a great challenge and is important to every country and to the global community as well. Previous TWG4 papers portrayed: 1) the state of infusion of information and communication technologies in the world; 2) the aspects of digital equity that researchers have pointed to; 3) initiatives taken; and 4) persisting issues and challenges.

At EDUsummIT 2015, TWG4 focused on onsite sustainable innovation with digital technology, primarily in the classroom. The absence of such sustainable innovation with digital technology was identified as the “new situation” requiring noteworthy attention. We submit that this critical gap needs to be overcome before any substantive progress can be made in educational equity with regards to digital technology. This paper has four sections: (1) Background and context; (2) Issues and challenges; (3) Recommendations to researchers, policy makers, and educational practitioners; and (4) Action plan.

**Background and Context**

Worldwide organizations, foundations, and universities seek to support innovation in education that will decrease the digital technology gap. Moreover, computer hardware/software companies understand that providing free equipment to schools might lead to future use. Therefore, for a combination of humanistic and business motives, a variety of initiatives have been taking place in developed countries, primarily on a local level, that provide some elements of digital equipment and underwrite...
teacher training. Critical dimensions of context, including curriculum, classroom routines, teachers' roles and evaluation practices are often overlooked. All elements: hardware, resources, teaching, learning opportunities, and the end purpose are conditional and dependent on each other. For this reason these elements are bundled together here.

We do not mean to neglect the basic issue of inequity of access to education and digital technology outside/inside the classroom during the mandatory schooling years. As shown in Figure 1 the United Nations specialized agency for information and communication technologies (ITU, 2015), indicates that there is impressive global progress in the penetration of Internet-based information and communication but that the penetration rate is only 9.5% in the least developed countries.

**Figure 1. ICT revolution and remaining gaps.**

Research indicates that it is essential to access broadband in order to derive full benefits from the Internet. Figure 2 graphs those populations who access the Internet through landline and mobile phones. As noted in the *World Economic Forum The Global Information Technology Report 2015: ICTs for Inclusive Growth* (Dutta et al., 2015), the widening divide in broadband access between the most developed countries and the least developed countries is a discouraging trend.
Figure 2. The widening digital gap: Fixed-line broadband penetration.

The World Summit on the Information Society (WSIS) set the target of 2015 for connecting all secondary schools and primary schools with ICTs (ITU, 2014). This target is an ideal and mammoth undertaking:

Evidence shows that LCRs ['learner-to-computer connected’ ratios] are generally decreasing across many countries, while school Internet rates are increasing – both generally and for fixed broadband specifically. However, change is not uniform and occurs at different rates in different countries. Typically, countries that have strong policies and set targets for ICT in education with high-level government and sector-wide support show the most rapid change. (p. 75)

While in general it must be seen as advantageous to have more computers for fewer students, it is not clear what the ideal ratio might be. This will depend a lot on national circumstances and on how computers are used; it is suggested that more research be conducted in respect of this indicator. (p. 75)

Research (such as Becker & Riel, 2000; Tamim et al., 2011) continues to find that the pedagogy in use makes the difference: technology used as « support for cognition » has greater effect than technology used for « presentation of content ». Bringing the Internet to schools and classrooms – whatever money, time and energy it may require – is only part of the equation. Technology must do more than reinforce the ‘teacher effect’.

Issues and Challenges

ICT-related educational programmes currently being designed, adopted and implemented by third party organizations and governments must consider that:

1. technology is changing rapidly and is often repurposed;
2. time is needed to implement and recognize agreed outcome benefits (what we refer to here, and describe later, as ‘the U challenge’);
3. there are differences and complexities within the contexts in different countries (political, social, technological, linguistic, cultural, economic, local and religious); and
4. all of the above are interdependent and have significant implications for teaching and learning.

Recommendations to researchers, policy makers, and educational practitioners

To help researchers, policy makers and educational practitioners move forward, we make the following recommendations:

1. Be aware that change is inevitable, and that sustainability has to embed adaptability (Rogers, 2014).
2. Design projects inclusive of adequate time to build a reflective process that anticipates the dynamics of the U challenge (the U challenge refers to those time periods that teachers are implementing uses of technologies when their performance decreases, due initially to the need to accommodate new practices (Mevarech, 1997), and finding the most appropriate ways to benefit from these practices, then later, having to grapple with technologies that become increasingly obsolete or incompatible).
3. Ensure understanding of what it is within a context that can gain systemic commitments in various contexts.
4. Commit resources and partners to long-term professional development of educators.
5. Build in systemic and synchronous top-down and bottom-up processes that will assure sustainability.

Action Plan

The working group will produce:

1. A research or white paper: To address gaps and promote educational equity there is a need to problematize long-term change in the digital age.
2. A policy brief: To offer policy guidelines that will help in the design of ICT in education projects and programmes that address digital equity to be sustainable:
   a. To emphasize the importance for third-party organizations and governments to develop an improvable set of action principles to improve outcomes when conducting ICT initiatives in technology-poor learning environments in developing and developed countries.
   b. To understand the essential conditions as a basis toward sustainability.
   c. To consider appropriate indicators and predictors along the way which are dependent on the context.
   d. To recognize and accommodate the U challenge.
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References


Thematic Working Group 5

Assessment as, for, and of Learning in the 21st Century

Summary Report

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Overview

Timely and informative feedback (a.k.a. formative assessment) is known to enhance and expedite learning, and it can be directly controlled by a teacher or a learning system. When learning tasks involve critical thinking and complex problem solving, determining relevant feedback for learners is not simple. Overemphasis in some places on summative assessments (grades, standardized test scores) and evaluations (comparative rankings, annual performance ratings) has resulted in too little emphasis on and support for formative assessment (individualized and constructive feedback during learning).

However, the ability of new technologies to provide support for formative assessment has risen considerably in recent years with the advent of intelligent agents, smart devices and cloud-based resources. The most promising technologies mentioned by the New Media Consortium and other groups include MOOCs (Massive Open Online Courses), Serious Games and Gamification. Those new technologies have the ability to generate and make use of large sets of data. Making use of big data requires sophisticated learning analytics of formative assessment data collected from many different learners in a wide variety of learning situations. Moreover, formative assessments can motivate individual learners, help teachers adjust individual learning paths, and inform parents and others of progress.

Issue
There is a shift in pedagogy towards dynamic problem-based and inquiry-based learning, in part to develop 21st century skills. Supporting effective problem-based and inquiry-based learning requires emphasis on timely and informative feedback to learners. The multitude of open education resources available to support learning can only be fully realized when coupled with meaningful formative assessments, especially in areas involving critical thinking skills. Digital literacy and reasoning literacy should be considered basic skills and require the support of new assessment strategies and techniques.

New forms of formative assessments and evaluations require new approaches, tools and technologies. One approach is to create an open assessments repository (OAR) that complements the open education resources (OER) already promoted by UNESCO. This repository could be used to leverage big data to support formative and summative assessments and evaluations and could include intelligent assessment technologies to ease the burden on teachers.

**Significance**

Without emphasis on formative assessment and support for new tools and an open assessments repository, nothing will change. New technologies such as MOOCs, Serious Games, and Gamification will be unable to realize their full potential and impact on learning will be minimal.

It is not possible to support critical thinking and 21st century skills without meaningful formative assessments. Large classrooms in developing countries present a particular challenge, especially when multi-grade classrooms are involved, due to the variety of learning needs and learner backgrounds. The need for efficient formative assessments requires using ICT to implement and support real-time formative assessments for complex problem solving learning tasks and guided inquiry learning situations.

**Prior Efforts**

The most promising recent advances in providing meaningful just-in-time, just-when-needed formative assessment for complex learning tasks involve a series of research efforts in Germany and the USA and tools that were consolidated in HIMATT (Highly Integrated Model Assessment Tools and Technology; see http://www.ifenthaler.info/?page_id=318). HIMATT provides a learner with a problem situation and then prompts the learner to indicate (in the form of text or an annotated graph) the key factors and their relationships involved in addressing the problem. This problem conceptualization can be compared to an expert conceptualization or reference model and analysed to indicate things for the learner to consider (see http://www.pirnay-dummer.de/research/comparison_measures_2011-03-30.pdf and https://sites.google.com/site/jmspector007/Home/selected-papers). These formative assessment tools require refinements and user-friendly interfaces to be used in face-to-face and online settings.
Promoting student engagement has become challenging in developing countries for large student cohorts with limited resources. A group at the Sri Lanka Institute of Advanced Technological Education have been experimenting with new teaching and assessing methodologies, combining team-based learning and guided inquiry learning. This approach enables staff to provide an engaging learning experience and develop collaborative work environment representing real world situations while integrating digital assessments. The ability to provide immediate meaningful feedback has facilitated significant improvements in learning. However, substantial training and mentoring of teachers is required.

Since the previous EDUsummIT in 2013, the use of information technology in assessment has flourished. Increasingly ePortfolio tools are embedded within learning content management systems, providing a holistic approach to recording achievements for formative assessment and in line with professional standards. Lock-down browsers are emerging which make a wider range of assessment styles available online. However, whether these are marked automatically or by humans, the limitations of this context require very large cohorts for sophisticated information tool use to become part of the assessment. Moreover, ePortfolios require much human time for human or sophisticated automated tools only in their infancy. Additionally, there is an issue of verifying that a particular learner created the ePortfolio. While they are promoted for their potential benefits to teaching, learning, assessment, and curricula, ePortfolios are seen as especially useful for extending and deepening assessment value beyond. However, empirical research into ePortfolio initiatives suggests the complexities and challenges are significant.

A research team at the Hong Kong Institute of Education recently investigated the relationship of individual differences and formative feedback orientation. Factors such as self-efficacy and accountability were found to be associated with learning goal orientation, whereas social awareness was associated with performance goal orientation. These and additional findings indicated that students with a learning goal orientation are more likely to feel usefulness of teacher feedback and feel personally responsible to respond to teacher feedback. What has not been explored is how these findings might change when formative feedback is being automatically generated by an intelligent assessment engine.

There are particular problems involved in providing large numbers of online learners with timely and meaningful feedback as they progress through a series of learning activities. The distributed basic education project in Indonesia required thousands of in-service teachers without degrees to complete a baccalaureate or lose their jobs. They had to do this while working. Being a full-time student while working full-time is a challenge. Those involved were constantly seeking ways to minimize such a heavy load. Getting immediate feedback on learning tasks was essential but extremely challenging to provide. Without the support of the Internet in remote areas, the only alternative was to send tutors to the countryside to help. The lesson from the experience in Indonesia is that ICT needs to be integrated into formative assessment.
Recommendations

In order for the full potential of formative assessments in the context of supporting critical thinking, inquiry learning and 21st century skills, the first recommendation is that key policy/decision makers at all levels need to be made aware of the significance of formative assessments and evaluations. The development of focused white papers clarifying and emphasizing the role of formative assessments and evaluations in learning and instruction should be developed and widely disseminated. These white papers should contain relevant theoretical and empirical grounding and short but poignant examples.

The notion of including digital literacy (skills associated with searching, evaluating, using, modifying and creating digital artifacts) and reasoning literacy (critical thinking skills) among the basic skills to be developed in primary and secondary education should be emphasized in the white papers and other activities of this working group (e.g., funding proposals). In addition, articulating the changing emphasis in learning from early (e.g., primary and secondary school levels) emphasis on static declarative knowledge to early emphasis on dynamic problem-solving activities should be emphasized. Integrating the use of small data devices in support of learning as well as in support of assessment should also be emphasized.

The historical use of assessments should be examined to determine to what extent assessments (both formative and summative) have been used to benefit a few rather than all learners. Issues of equity, meritocracy and social justice are, or should be, an integral concern with regard to both formative and summative assessments.

Big data (e.g., large sets of data with regard to learner profiles, preferences, and performance in a variety of learning situations) has yet find its way into the creation of dynamic formative assessment mechanisms. The same can be said with regard to small data (e.g., specific data collected by a learner’s portable or wearable device), although examples of small data being used to customize some learning scenarios is appearing in the form of augmented realities, especially in the area of informal learning. Particular emphasis on tools and technologies to integrate big and small data into learning and especially into formative assessment should be encouraged on the part of governmental funding agencies.

What is needed in order to move assessment into the 21st century are new tools and technologies especially well-suited for complex problem solving domains and personalized learning. In addition, new assessment tools and technologies could then be used for meaningful diagnostic and cross-cultural purposes to form the basis of informing and improving educational systems, rather than the false competition and rather onerous environment created by current high-stakes testing in some places.

In summary, the recommendations of TWG5 for various constituencies, (e.g., ministries of education, governmental funding agencies, foundations supporting education, federal, state and local school administrators, teacher preparation programs, and educators in general) is to take seriously educational goals that include developing effective problem solvers, independent critical thinkers, and life-long learners – doing so then requires that particular emphasis be placed on providing space (scaffolding and
support) for learners to explore, discover, learn from missteps, and gradually develop confidence and competencies across a variety of learning tasks and learning experiences. Formative assessments are critical for the associated processes of learning to occur effectively and efficiently. Given new learning approaches and the realities of life in the 21st century, new assessments tools and technologies are needed.

**Actions**

TWG5 has developed a discussion paper based on the contents of this policy brief that will be included in an EDUsummIT eBook. In addition, members of TWG5 (Spector and Gu) have already submitted a proposal to AERA to fund a meeting to create the specifications for an Open Assessment Repository (OAR) – an open and extensible clearinghouse of case studies and formative assessment exemplars, instruments, tools, and technologies), especially in support of developing and assessing complex problem solving and critical thinking skills. Additional funding proposals that go beyond support for a meeting and that aim at the development, implementation and dissemination of new and powerful formative assessment tools are recommended; members of TWG5 and others will identify and pursue relevant opportunities from a variety of sources, including governmental funding agencies and private foundations.

Members of TWG5 will develop and disseminate white papers for a variety of constituencies (e. policy makes, school administrators, teachers, teacher preparation programs, etc.) that clarify and emphasize formative assessments and formative evaluations. The first step in this process is to identify the core content that will appear in all of the TWG5 white papers; Spector will take the first step in that direction by 1 December 2015, and then ask various TWG5 members to elaborate separate papers for the various constituencies by 1 March 2016. When the entire working group has signed off on the white papers, they will be widely disseminated (target date for dissemination is 1 April 2016).

TWG5 already has draft papers from various members (Deneen, Fluck, Kulari, and Spector) focusing on formative assessment. These draft papers will be consolidated into two papers to be submitted to Knezek (gesundheit) by 15 January 2016 for the special issue of Educational Technology and Society. One of the papers will focus on relevant and recent research pertaining to formative assessment tools and technologies and the other will focus on the development of a conceptual framework for extending the use of data (big and small) into formative assessments and evaluations in support of a variety of purposes (e.g., career planning, advising, formative feedback, improving courses, curricula, and programs, etc.). Both papers will take into account both formal and non-formal learning situations. The lead for the two ETS papers has yet to be determined. The group agreed to keep the order of authors the same (as reflected above) with a note that all TWG5 members have contributed equally to these various papers. However, with regard to the two ETS papers, a minor change should be made to put the lead person responsible as first author (with the same note that all have contributed about equally, which has been the case to date). Lead authors should be determined by 1 October 2015.
References


Disclaimer

The views and opinions herein are those of the authors only and not of any organization.
Thematic Working Group 6

Creativity in a Technology Enhanced Curriculum

Summary Report

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Introduction

A key focus at the Thematic Working Group 6 on Creativity in a Technology Enhanced Curriculum at EDUsummIT 2015 in Bangkok, was on building an understanding of areas of intersection of creativity and technology in teaching and learning, and identifying ways that creativity can become more deeply integrated into technology-rich curriculum for teachers and students within developed and developing contexts. A main part of the rationale for this lies in the vital role that creativity plays as a principal driver for much of the growth, development, and new innovations that have occurred throughout human history and society, as well as the increasing need for it to address problem solving and learning in our complex world. Contemporary technologies provide new and powerful ways for individuals and groups of individuals to be creative – and it is important to give consideration to how these opportunities fit within a 21st century framework for education.
The Context

Technology has altered the world that we live in at an accelerating rate of change. This rapid pace of development of new technologies has made it a challenge for implementing constructive classroom technology integration. Creativity can inform this problem, as a core issue in teaching and learning for the 21st century. And the two issues of creativity and technology can be fruitfully considered in conjunction. We can see a lot of young people who spend time voluntarily “in intense learning as they tackle highly technical practices, including film editing, robotics, and writing novels among a host of other activities across various DIY networks” (Kafai & Peppler, 2011, p. 89). In such learning situations, students go beyond programming code or texts in traditional ways, but additionally work to create, repurpose, and remix multimodal representations of knowledge (Jewitt, 2008). According to Spencer (2005) “the DIY movement is about using anything you can get your hands on to shape your own cultural identity, your own version of whatever you think is missing in mainstream culture” (p.11).

Our world is changing, and while this is nothing new, the rate of change scales up in conjunction to technological growth. Recent decades have shown us an incredible flowering of creativity and innovation fueled by the capabilities of digital technologies. From Google to Facebook, from cloud computing to YouTube channels, new technologies have altered and informed how we live, work and connect with each other (Mishra, 2012). These technology elements, when combined with the changing demographics, social pressures and economics of globalization, create opportunities and challenges, which creativity can speak to. Given this intertwined relationship between creativity and technology it is understandable that educators (particularly those who are technically inclined), and other educational stakeholders, have suggested that teaching and learning today needs to emphasize these connected issues. It is important for scholars, researchers and practitioners alike to explore the nature of the relationship between technology and creativity, particularly in varied, global educational contexts. For instance, Kafai and Peppler (2011) speak about DIY communities, and identify three essential technical practices that contribute in important ways to youths’ digital production skills. These skills include coding, debugging, and remixing. This is consistent with discussions about a role of creativity in connection with computing and particularly with a support schools to programming in Scratch (Brennan, Balch, & Chung, 2014). Since the nineties creative and original approaches to Informatics Education has been highlighted by Blaho and Kalaš (1998).

These are difficult challenges, because both technology and creativity are complex topics, which even as standalone issues have confounded many hard-fought attempts to find effective approaches for integrating them into teaching and learning settings. Secondly, the ‘what’ versus ‘where’ approach, has tended to overlook the contextualization of IT within developing contexts. But despite the challenges inherent, developing a stronger place for creativity in a technology-enhanced curriculum is vital.
Key Issues and Challenges

There are multiple issues and challenges associated with creativity in education, several of which arose in our working group discussions at EDUsummIT 2015.

What is creativity?

To begin with, it is essential to start from a shared working definition of a construct. Since creativity was thematically new to EDUsummIT in 2015 (this being the first year for the “Creativity in a Technology-enhanced Curriculum” group), establishing a definition based on group member input was key. Multiple discussions of creativity revealed a variety of approaches and ideas even within the group. In order to work forward from a shared understanding, we identified some core elements of creative thinking/practices that recurred in the discussions, and that more importantly were supported by scholarship.

Most definitions of creativity drawn from literature across education and psychology, focus on the fact that creativity is both “novel” and “effective.” In this sense, creativity can be described as the production of useful solutions to problems, or novel and interesting ideas across domains, which create products and/or artifacts and impact thinking (Amabile, 1988, 1996; Oldham & Cummings, 1996; Plucker & Beghetto, 2004; Zhou & George, 2001, 2003).

While novelty and effectiveness or value play a role in many versions of “creativity” definitions, our definition takes this concept and builds on it with Mishra & Koehler’s (2008) concept of “wholeness”. They describe this third construct of wholeness as something used in an ordered and aesthetic manner in a specific context. Thereby, the working definition for creativity used in TWG 6, is the Novel, Effective, and Whole definition applied by Mishra & Koehler (2008). In this way, creative ideas are not just novel and effective, but they have a certain aesthetic sensibility, which is connected to and evaluated within a specific context or paradigm.

Where is creativity?

While our working definition is supported by research and encompasses key aspects of creativity, we acknowledge that arriving at any shared definition of a subjective construct like creativity is challenging. In working through this, it was proposed that it is just as valuable to consider Csikszentmihalyi’s (1997) question of: “Where is creativity?” In this he asserts that creativity exists as an interaction between the individual, the field, and the domain- as represented in the diagram below.

As the diagram (refer Figure 1) indicates the Person, the Field and the Domain have to work together in order for something to be declared Novel, Effective & Whole. The Person produces variation through their individuality that the social organization of the domain (the Field) selects or rejects variation – which in turn becomes part of the Domain – which then transmits the variation onto the next set of individuals. Thus merely looking at the individual does not do justice to the complex process involved in thinking about creative work. Such an approach also allows us to address the developed versus developing context dichotomy.
At the summit

Our group identified three key areas of challenge where creativity should exist in a technology-enhanced curriculum. The group broke into sub-groups in order to consider each of these areas of challenge. These three areas, all related to Creativity in a Technology Enhanced Curriculum, are:

- Policy and Curriculum
- Teacher Education and Professional Development
- Assessment

Each of these was discussed by the sub-groups independently and then brought back to the larger TWG6 group for discussion and feedback. There were repeated, informal, sessions over the two days. Each of these sub-groups is defined and described below.
Creativity can be learned. Sadly, it cannot be taught. However, since it is a thinking skill it can only be ‘learned by doing’ or as ‘learning in action.’ Creativity involves approaches to thinking rather than a set body of knowledge that can be taught. However, we can reinforce and support sustained creativity by engaging with the idea that it can become a ‘habit of the mind’. However, this also means that the education system / educators need to be able to recognize and support a sustained facilitation of creativity as a habit of the mind, and agree upon what that is and how to do so – something that can vary greatly across contexts and cultures.

So essential challenges involve convincing policy makers, who often prefer clear answers and objectivity, that it is important to infuse curricula with creativity – an area that can be subjective without one “right” answer. Additionally, a challenge lies in how to implement something as context-driven as creativity in ways that are broad enough to speak to policy and curricular choices across varied settings.
Teacher Education and Professional Development Sub-Group:

Led by Danah Henriksen. Other members include Janet Cochrane, Eugenia Kovatcheva, and Paolo Tosato

The approach and pedagogy used by teachers is often a primary driver of how students develop. Teachers who model creativity tend to fluidly enhance, support and develop the tendency in their own students (Amabile, Conti, Coon, Lazenby, & Herron, 1996). Starting at the level of the teacher and classroom is essential to developing creativity as a habit of mind for 21st century learners. Building teaching dispositions that take advantage of the affordances of new tools for learning and thinking creatively is essential (in ways not possible without new technologies). But effective teaching is difficult in itself, even without the added elements of creative and technology-savvy practices. How do we support the development of creative pedagogy, along with effective use of classroom technology to support the 21st century teacher and student?

With teacher education programs as primary drivers of new teacher development (as well as professional development opportunities for teachers broadly) it is essential to build a platform for teacher education programs that addresses creative, technology-rich approaches and pedagogies.

Assessment Sub-Group:

Led by Punya Mishra. Other members include Miroslava Cernochova and Sacha DeVelle

The arena of assessment is rife with multiple challenges which tend to present as dichotomous tensions. Several of these were identified by the assessment sub-group within the creativity group. One key tension lies in assessment at the individual level vs. the group level. In other words, how do we get students to engage in the kinds of collaborative and open-ended products that support creativity, while also assessing their individual performance?

Another issue is in psychometric vs. process/output testing. Do we test the characteristics of an individual on a psychological basis, which has traditionally been supported by creativity research? Or do we assess based on the creativity of work and outputs (as may fit more easily in a classroom setting).

The dilemma of process vs. product also arose, in considering whether it would be more effective to evaluate change over time vs. evaluating output. A product is concrete and more traditionally amenable to evaluation in education, but process may be more important to teachers since its respects the whole learner (process may be idiosyncratic and playful, which also brings up another challenge). For example, an ICT approach tends to focus on the final output or product, compared to the Art teacher who is concerned with the process.

Finally, the problem of domain general vs. domain specific assessment of creativity arose, and this is an ongoing problem and dispute among most creativity researchers. Evaluation becomes more challenging unless we start from a place of solid agreement on
whether creativity is located specifically and narrowly within domains, or whether it is a more general and extendable thing.

The overwhelming theme of creativity and assessment then revolves around the challenge of navigating the different tensions that play out in the process of evaluating and assessing creativity. For this reason, it is important that we not focus on just one approach towards assessment but rather explore a range of different and alternative forms of assessments that would allow for the dynamic, flexible, triangulation of the construct as it plays out in different learning contexts. Finally, there is clearly need for research that is deeply connected to these different learning contexts (which in turn exist in a differ in a range of dimensions, formal – informal; disciplinary – trans- or multi-disciplinary and so on).

Recommendations

Based on the discussions over the two days the group came up with some key recommendations on each of these three areas. Briefly these are as follows:

Policy/Curriculum

• **Creativity needs to be featured in policy at all levels (Macro / Meso / Micro)**
  It is clear that creativity is complex and can be seen as working across all aspects of the teaching learning process, particularly when coupled with the potentials of technology. Thus it is important that educational policy needs to emphasize creativity across all levels: Marco, Meso and Micro, i.e., whether at the level of national policy, state or school district-wide, or individual schools and classrooms.

• **Creativity should be embedded across the curriculum**
  Creativity is not a domain by itself but rather a way of thinking and approach to problem seeking and solving that cuts across disciplines. Thus creativity is as important in the sciences and mathematics as it is in the arts. This is often forgotten and needs to be part of every policy-makers thinking.

• **A greater push for research to identify models, and practices**
  Though creativity research has received greater attention recently, there is much we still do not know about instantiating it in the formal and informal learning contexts. Clearly there are models and practices that appear to work, but more systematic research is clearly the pressing need.

Teacher Education/Teacher Professional Development

• **Develop Teacher Education curriculum that integrates creativity and its components across the program**
  Current teacher education curricula may give some emphasis to teaching creatively – though even there it appears spotty at best. The other aspect of teaching to enhance creativity in students has received even less attention. Integration of ideas related to creativity need to be across the program and curriculum.
• **Specific course/programs focusing on creativity and technology**
Even as we seek to suffuse a “creativity mindset” across programs of study in teacher education, we see the need for more specific courses that target creativity and technology and their use in the classroom teaching/learning context.

• **Identify/use a framework that connects creativity and technology to curriculum guidelines**
Curriculum guidelines are overarching structures that determine how specific curricula are designed. It is important that the dual-goals of teaching creatively, and teaching for enhancing creativity, be incorporated in these broad guidelines.

**Assessment (in context of ICT)**

• **Recognize that assessment of creativity exists within a range of tensions/dilemmas**
Issues related to the assessment of creativity exist along a range of dimensions (individual – group, process – product, domain general – domain specific etc. These are not problems to be solved but rather essential tensions or dilemmas that need to be resolved in a context sensitive manner.

• **Alternative forms of assessment - dynamic, flexible for triangulation**
It is essential that we not focus on just one approach towards assessment but rather explore a range of different and alternative forms of assessments (i.e. open ended versus more constrained tasks) that would allow for the dynamic, flexible, triangulation of the construct as it plays out in different learning contexts.

• **Evidence based research from the classroom**
Finally, there is clearly need for research that is deeply connected to these different learning contexts (which exist in a differ in a range of dimensions, formal – informal; disciplinary – trans- or multi-disciplinary and so on).

**Conclusions**

Overall the TWG6 on *Creativity in a Technology Enhanced Curriculum* at EDUsummIT 2015 in Bangkok had a productive two days of meetings. The expectation is that we will be following up with multiple conference presentations, as well as journal articles and policy related documents along time line laid out by the organizers.

Creativity is an important topic and needs greater attention by the educational community. We see this meeting as a foundation for high-impact work in the future.
References


Background and context

Technology Enhanced Learning (TEL) has become increasingly important on the agendas of education policy makers, school leaders and teachers around the world. The policy level rationale for emphasizing TEL is not only to improve learning outcomes, but to also transform the learning process to foster new capabilities that are needed for life and work in the 21st century. UNESCO (2008) published a document that puts forward a policy framework that aligns national goals and curriculum in education as well as the role of ICT in teaching and learning with the state of economic development. Technology-enhanced learning and teaching (TEL&T) should help students develop digital literacy and enable them to use technology appropriately for communication, collaboration and problem-solving.

Indicators of quality TEL&T are one of the two new themes proposed by UNESCO (Bangkok) for introduction in EDUsummit 2015. The context for TWG7’s work on indicators is to serve the need for fit-for-purpose indicators as part of the implementation of the Post-2015 Education Agenda. While the details of this Agenda are still to be finalized by the UN summit in September 2015, the theme will be Towards inclusive and equitable quality lifelong learning for all, as announced in the Incheon Declaration in May 2015. One of the intended outcomes of the Working Group (TWG7) is to develop a policy brief on this theme and present it to the Asia-Pacific Ministerial Forum on ICT in Education (AMFIE) at its next meeting.
An important goal of TWG7 is to provide advice on and suggestions for indicators of quality TEL&T as an integral part of the set of global indicators that could be used to monitor the implementation of the post-2015 education agenda. These indicators could be expanded and embedded into thematic, regional and national indicators to serve their respective monitoring and evaluation purposes. The primary focus is on learning outcome indicators, but selected input and process indicators will also be included to help us understand and improve the link between policy, policy implementation, outputs and outcomes.

Indicators for quality TEL&T are important not only at the national and global level. Stakeholders at individual, classroom, school and sub-national (e.g. district and project) levels would also need indicators to provide feedback and guide improvement relative to TEL&T implementation and enhancement. As suggested by World Education Forum Technical Advisory Group (2015), these global indicators should guide development of, and be incorporated into, indicators used at national and lower levels of monitoring and evaluation. This practice would promote development of a corpus of indicators that are contextually relevant. It would also allow comparability of indicators across institutions, projects, districts, etc., which will facilitate multiple levels and units of comparison, and potentially provide opportunities for better knowledge building and peer learning about TEL&T.

Issues

The working group started with three basic issues: What is quality TEL&T? Why are indicators for quality TEL&T important? What types of indicators are needed? A summary of the discussions are included below.

What is quality TEL&T?

It was generally agreed that the primary focus should be on preparing learners for life in the 21st century. The term “21st century skills” is considered to be too narrow, as well-being in the 21st century is not simply a matter of skills or competence, and requires well-rounded socio-emotional and metacognitive maturity. It was also agreed that digital literacy, critical thinking, creativity, collaboration and communication are necessary capacities for the 21st century. Further, it was generally agreed that learner-centered approaches to pedagogy would be necessary for students to develop socio-emotional and metacognitive maturity, and the capacities identified for success in the 21st century.

Why are indicators for quality TEL&T important?

It is obvious that we need appropriate indicators for quality TEL&T for us to understand what has been achieved through TEL&T. Outcomes of TEL&T implementation depend on how it is implemented and the associated conditions. An appropriate set of indicators should also help us monitor and understand how the implementation is progressing, and to signal problems before they become serious. Ideally, we would want to be able to make adjustments to the implementation plan and/or make strategic changes to policy and practice based on the feedback we receive from the indicators. We would also want our assessment of implementation, policy and practice to influence the nature and
development of the indicators we use. For this, we need indicators that are coherent and are connected to an appropriate conceptual framework so that these will help us construct better theories for TEL&T. In summary, quality TEL&T should serve to help us achieve four primary purposes:

- Assess what has been achieved through TEL&T implementation;
- Identify what matters most in our planning and implementation of TEL&T;
- Monitor progress and development in the most crucial aspects of TEL&T, and provide feedback on the innovation process for continuous improvement; and
- Support theory building, policy and practice in promoting change & innovation for quality TEL&T.

What types of indicators are needed?

In the discussion, it was agreed that most of the existing indicators related to TEL&T measure conditions for learning, such as the technology infrastructure, teachers’ qualifications, etc. The most important type of indicators, which are also seriously lacking, are indicators for measuring learning outcomes that are important for the 21st century. Another important category of indicators is indicators for learning interactions (sometimes referred to as learning processes). People do not learn simply from being exposed to media or technology. Learning results from interactions and engagement. While learning interactions may take place between learners and digital learning resources, deep or complex learning often requires deeply engaging learning interactions among learners and between learners and teachers that cannot be realized through the adoption of digital technologies alone. The quality of students’ learning outcomes depends critically upon the classroom environment, pedagogy, lesson and learning activity designs that together constitute the core determinants of TEL&T interactions. We need indicators that can capture and link the variety of learning interactions to the observed learning outcomes if these indicators are to help us improve the design and implementation of TEL&T. In summary, four types of indicators are needed:

- Learning outcomes
- Conditions for learning
- Learning interactions (i.e. learning process indicators)
- TEL&T use (how technology is used to support the totality of learning interactions)

A systemic, multilevel framework to conceptualize quality indicators for TEL&T

There is a rich body of literature that demonstrates the need for pedagogical, curricular and assessment innovations to accompany TEL&T if we are to achieve the desired outcomes (e.g., Voogt & Knezek, 2008). Consequently, TEL&T initiatives need to be supported by strategies and mechanisms for teacher learning, leadership learning and organizational learning. Further, the biggest challenge to the implementation of ICT-enabled learning innovation is scalability (Kampylis, Law, & Punie, 2013; Dede, 2006). Studies on change, innovation and sustainability all point to the need for change to be multilevel (Blamire & Gerhard, 2009; Law, Kampylis, & Punie, 2015). At the lowest level
of the education ecosystem are students learning within classroom contexts, which is hierarchically nested within schools and within systems (Davis, 2015). There is agreement that the changes taking place at each level impacts, and provides feed-forward/feedback on the change processes taking place at the other levels.

While most multilevel models of change only characterize change at the classroom level as learning and changes at the other levels are seen as implementation process or factors, Law (2015) proposed a parsimonious multilevel learning model to underpin the conceptualization of the many indicators involved in TEL&T, as represented in Figure 1. (The list of indicators in the table is only an incomplete, preliminary set for illustrative purposes.) There are four types of indicators at each level: conditions for learning, learning interactions, e-learning use, and learning outcomes. The learning outcomes at each level are strongly influenced by the status of the other three sets of indicators at that level. For example, the red arrows indicate how student learning outcomes are directly influenced by the learning interactions and e-learning use of students, which are in turn influenced by conditions of learning for the student such as school ICT infrastructure, pedagogy and assessment practice.

The working group found this conceptual framework useful for providing a coherent and consistent set of interacting indicators at all four levels, and in delineating the interactions of the indicators at different levels. For example, the blue upward arrows in Figure 1 illustrate some of the support relationships across levels: teachers’ learning outcomes (TPACK, learning and assessment design expertise) directly link to the pedagogy and assessment practice as experienced by their students as conditions for learning; national schemes to support joint-school e-learning innovation projects (as system-level learning outcomes) provide opportunities for learning interactions at the teacher level; and staff appraisal criteria (as school-level learning outcomes) is one of the conditions influencing teacher learning. It should be noted that within this framework, the learning outcomes at the school and system levels are outcomes of the decision-making process at the respective levels. By conceptualizing the decision-making processes as learning processes highlights the iterative, continuously improvable nature of these processes. Further, one could also draw downward arrows in Figure 1 to shows how indicators at the hierarchically lower levels (e.g., student and teacher levels) can serve to inform increasingly systemic decision-making for policy and practice at the higher (e.g., school and system) levels.
Members further pointed out that even in developing countries, a great deal of data collection occurs with a high level of detail, but the purpose for collecting data may not be clear. The proposed conceptual framework for quality TEL&T serves to: (1) focus the purpose of data collection; (2) guide the definitions and criteria for levels of quality for the indicators; (3) delineate how the indicators feed forward and feed back on the different levels of the system; (4) provide a mechanism for indicators to go to the stakeholders at appropriate levels—not just to policy makers; and (5) check and improve alignment across levels in the process of TEL&T implementation.

Challenges

A number of challenges were identified in relation to the theme of the working group. These include:

- Identifying indicators that are meaningful and have clear implications for policy and practice;
- Identifying indicators that provide feedback for refinement and decision making and inform progress;
- Communicating indicators clearly to different audiences and across levels;
- Going beyond the measurement of input;
- Creating operationalizable and valid measures for the indicators; and
- Creating quality indicators that are applicable across contexts.

Further challenges and feedback were collected by the group leaders when they presented the outcomes of the group discussion to the other working groups. These further challenges and critiques include:

Figure 1. A diagrammatic representation of the interrelationship among the different levels of indicators.

<table>
<thead>
<tr>
<th>Level</th>
<th>Conditions for learning</th>
<th>Learning interactions</th>
<th>e-Learning use</th>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>School ICT infrastructure • Access to ICT &amp; Internet at home • Pedagogy • Assessment practice • Curriculum</td>
<td>Peer collaboration in open-ended problem solving • Peer-assessment</td>
<td>e-Learning portfolio • Student generated content (e.g. webpage)</td>
<td>Subject matter knowledge • 21st skills: • Collaboration &amp; communication • Digital literacy • Knowledge building</td>
</tr>
<tr>
<td>Teacher</td>
<td>School vision for e-learning • Staff appraisal criteria • Professional development opportunity</td>
<td>School-based co-planning and decision making</td>
<td>School intranet for sharing and discussions • Innovation Project website for sharing of Co-constitutive TEL&amp;T plans and digital resources</td>
<td>Teachers' Technological Pedagogical Content Knowledge (TPACK) • Teachers' learning and assessment design expertise</td>
</tr>
<tr>
<td>School</td>
<td>National educational priorities • National e-learning masterplans • School inspection criteria</td>
<td>School-based project team co-planning and decision making</td>
<td>School intranet/ Innovation Project website to support discussions, monitoring, evaluation and decision making of e-learning innovation projects</td>
<td>School ICT infrastructure • School vision for e-learning • Staff appraisal criteria • Timetabling &amp; other arrangements for co-planning and joint-school collaborations</td>
</tr>
<tr>
<td>System/policy</td>
<td>National digital infrastructure • National education &amp; e-learning resources • National schemes to ensure ICT &amp; Internet access for learning outside school</td>
<td>Multi-stakeholder steering committees on education masterplan • Annual examination • School visits, class observations, for project monitoring, inspections, etc. • Exchange visits to other countries • Participation in international ministerial/policy events (e.g. organized by UNESCO)</td>
<td>Secure student portals for easy set up of joint-school student collaborative learning projects • School-based (available by European Schoolnet) • Portals for teachers and school leaders for sharing, policy consultation &amp; feedback, etc.</td>
<td>National educational priorities • National e-learning masterplans • School inspection criteria • National schemes to support joint-school innovation projects • National criteria for teacher &amp; school leadership competence for e-Learning • School inspection criteria</td>
</tr>
</tbody>
</table>
• Linking indicators from one level to another and seeing how indicators interact is not simple;
• Developing indicators that are meaningful across country contexts;
• Including indicators at the system level that go beyond educational policy (e.g., partnerships with different stakeholders, the role of communities, etc.);
• Addressing informal learning in the conceptual framework; and
• Developing indicators for cyber-wellness and digital citizenship.

Recommendations to researchers, policy makers, and educational practitioners

• For policy makers and funders, we recommend that measures should be taken to identify indicators that matter (at all levels, and including indicators of processes and learning outcomes as well as inputs) and establish mechanisms for these indicators to influence policy and decision-making.
• For educators, institutional leaders and practitioners, we recommend the use of indicators to provide feedback and ensure alignment across contexts, processes and outcomes within a level; and to provide feedback on alignment across levels.
• For researchers, we recommend (1) development and validation of indicator measures that are valid, reliable and easily implemented, and (2) establishment and curation of a repository of indicator measures.

Action plan

The group agreed to work on the following publications within the time schedule indicated:

1. Complete by 5 October 2015 an extended abstract (~4 pages) for the Working Group discussions in Bangkok, for compilation into a summary EDUsummiT 2015 publication for fast public release.
2. Complete a paper on the indicators framework, rationale, etc. by January 2016.
3. Produce a policy brief (4 pages), which would be an outcome of the EDUsummiT from TWG7, and would possibly also be presented to AMFIE.
4. Different group members may self-organize to develop papers on examples to illustrate how the framework can be used. They can target the various TEL&T related conferences such as SITE http://site.aace.org/conf/, ECER http://www.eera-ecer.de/ecer-2015-budapest/, and CITE Research Symposium http://citers2015.cite.hku.hk/.

References


Background and context

The proliferation of digital technologies has yielded enormous benefits to individuals, groups and institutions, locally, nationally and internationally. Besides the new economic and social opportunities that these new networked technologies offer, there is an emerging awareness of dangers and threats to individuals, groups and institutions related to unequal access, unethical use, such as cyberbullying and cybercrime, such as identity theft, hacking, virus creation and distribution, abuse and radicalisation, just to name a few. Most disturbingly, children are particularly vulnerable and often targets of cybercrime, trafficking, abuse and radicalisation (Secretary of State for the Home Office, 2010). In response to these challenges, countries, such as Australia, are mapping the cyber threat environment and in September 2015, the Australian Cyber Security Centre has released its first unclassified report describes the range of cyber adversaries targeting Australian networks and offering mitigation advice (Australian Cyber Security Centre, 2015). It is vital that the global citizenry is empowered to better understand the opportunities, but also the threats that the new realities of globalising networked technologies offer.
The topic of “digital citizenship” and “cyber wellness” is gaining momentum all over the world. There are a lot of organizations and individuals that are working on this topic. In response to many and different discussions, supporting UNESCO’s vision of “transform lives through education” (Incheon Declaration Education 2030, 2015) and recognising the potential for opportunity, but also harm of the growing use of digital networked technologies in people’s lives the EDUsummit working group (TWG 8) accepted the invitation to submit a white paper on issues related to Digital Citizenship and Cyber Wellbeing.

This white paper begins by exploring the meaning and connection of Digital Citizenship (DC) and Cyber Wellness (CW). Conceptual clarity is vital for the development of effective policy decision and strategic alignment and buy-in and ownership of change is virtually impossible in a policy environment that lacks conceptual clarity (Dobozy, 2013).

**What is Digital Citizenship?**

Citizenship is all about belonging and acknowledging that citizens have rights and responsibilities. In the words of the British sociologist T.M. Marshall (1950):

> Citizenship is a status bestowed on those who are full members of a community. All who possess the status are equal with respect to the rights and duties with which the status is endowed. There is no universal principle what determines what those rights and duties shall be, but societies in which citizenship is a developing institution create an image of an ideal citizenship against which achievement can be measured and towards which aspiration can be directed (pp. 149-150).

Citizenship also involves responsibilities as a member of the community, such as being ethical and respectful of others. So, although the term digital citizenship has been used in reference to the use of technology to support social participation within a country or the world, more recently, the term has been used to focus on the norms of appropriate, responsible behavior with regard to technology use (Digital Citizenship Institute, 2015).

**What is Cyber Wellness?**

The Singaporean Ministry of Education (2014) defined Cyber Wellness as follows:

> Cyber wellness refers to the positive well-being of internet users. It involves an understanding of the norms of appropriate, responsible behaviour with regard to technology use as well as knowledge, skills, values and attitudes on how to protect oneself and other internet users in the cyber world. It looks into the positive physical and psychosocial well-being of students in their use of mobile and internet technologies (p. 1).

Given these overlapping definitions, the purpose of TWG 8 group Digital Citizenship and Cyber Wellness is to examine the impact of digital networked technologies and digital media on civic life and makes recommendations to assist policy makers in developing policies and frameworks that allow for safe and secure digital life of individuals and groups as digital citizens in the existing and emerging digital landscape.
Challenges

The following challenges were recognised by TWG8:

1. Inconsistent and unequal access to safe and secure networked technologies (systems and infrastructure) in and out of school

2. Increasing loss of privacy and lack of control over one’s data, especially when children are in mandated school environments

3. Lack of awareness of potential positive and negative impact of digital technologies

4. Lack of informed and ethical online personal, group and institutional behaviour and use of data

5. Lack of policies that employ a systems approach to prevention, detection, intervention and response

6. Lack of professional standards related to digital citizenship and cyber wellness for pre- and in-service teachers

7. Policy decisions are often driven by high profile stories not by evidence-based research

8. Children are particularly vulnerable and often targets of cybercrime, trafficking, abuse and radicalisation

Recommendations

The following recommendations were made to address the identified challenges by a variety of stakeholders including researchers, policy makers, and educational practitioners:

1. Develop safe and secure networked (systems and infrastructure) technologies in and out of school, which impact children’ and educators’ lives in and out of school

2. Develop and enforce personal, group and institutional data privacy policies, skills and competencies

3. Implement specific actions to raise awareness of the potential positive and negative impact of digital technologies

4. Develop education policies and frameworks that encourage ethical online behaviour and use of data by individuals, groups and institutions

5. Develop policies that incorporate a systems approach to cyber wellness that includes prevention, detection, intervention and response

6. Develop, support and assess professional standards relating to digital citizenship and cyber wellness for pre- and in-service teachers
7. Address digital citizenship and cyber wellness supported by evidence-based research, while being sensitive to high profile media stories

8. Collaborate with national and international agencies to prevent, detect and intervene to instances of cybercrime, trafficking, abuse and radicalisation

**Action Plan**

This report concludes with an Action Plan developed during EDUsummit 2015. It is intended to (a) strengthen our international collaboration, and (b) outline the future actions of TWG8.

**Publish:**

Synthesize 2-day working session into 4 page White Paper

- Write 4-page UNESCO Policy Brief
- Develop “academic” paper for publication
- submit an article for UNESCO Bangkok’s ICT in Education Newsletter (September)
- link to other research activities/publications

**Present:** at national and international conferences: e.g., SITE, AERA, ASCILITE, ATE, ICEM, WAIER, WEF, QED, NPSE

- Open-source, media presentations, *The Conversation* ([http://theconversation.com](http://theconversation.com))
- COP ITU Strategy Regional Workshop 24-25 October
- FOSI conference Washington DC November 18
- UNESCO’s Asia-Pacific Ministerial Forum on ICT in Education

**Continue Working as Group (and welcome others):**

- Create the *Digital Citizenship Network*
- e.g., a wiki-type space

**Disseminate through Social Media**

- blogs
- microblog
- linkedin article

**Deliver the UNESCO policy guidelines and policy brief to gov leaders**

- leverage existing networks (ITU, Intel AS Policy Group, WEF, African org, etc)

**Catalog existing programs and toolkits for educators** blogs

- Acquire and organize information on digital citizenship and cyber wellness policies, initiatives and resources

Finally, it is important to note that the work of other TWGs may build on or supplement our work.
References


Thematic Working Group 9

Curriculum - Advancing Understanding of the Roles of Computer Science/Informatics in the Curriculum

Summary Report

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Andrew Fluck, University of Tasmania
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Jason Zagami, Griffith University

Introduction

At EDUsummIT 2015 it was argued that the major rationale for including Computer Science as a subject in the K-12 curriculum are economic, social and cultural. The economic rationale rests not only on the need for a country to produce computer scientists to sustain a competitive edge in a world driven by technology but also on the requirement for Computer Science-enabled professionals in all industries to support innovation and development. The social rationale emphasises the value in society of active creators and producers rather than passive consumers of technology. Such capability provides people with power to lead, create and innovate within society and therefore is also an issue of entitlement to "powerful knowledge" (Young, 2013) giving individuals opportunities to choose their role in society. The cultural rationale rests on enabling people to be drivers of cultural change rather than having change imposed by technological developments.

In this brief paper we explain firstly the background to recent curriculum changes and the global context in which they are taking place. Then we explain the issues and challenges for establishing and maintaining the roles for Computer Science in curricula for K-12. Next we present solutions and recommendations for policy makers, educators, industrial partners and researchers and finally we outline our actions for taking forward these solutions.

Background and context

Previous EDUsummiTs examined broadly the skills needed in a world driven by technology. EDUsummIT 2011 identified the importance of new competencies for 21st-century learning, including digital literacy, in the curriculum (Voogt, Erstad, Dede, &
Mishra, 2013). EDUsummIT 2013 examined computational thinking as a critical set of thinking skills of equal importance to literacy and numeracy in the education of all (Voogt, Fisser, Good, Mishra, & Yadav, 2015). This importance of computational thinking was highlighted by Wing (2006), especially in the context of Computer Science, although the concept is generally attributed to Papert (1980, 1996) who examined computational thinking in relation to learning mathematics and other subjects. Subsequently Barr and Stephenson’s (2011) work led to an operational definition published by the Computer Science Teachers Association (CSTA) incorporating the following core characteristics:

- Formulating problems in a way that enables us to use a computer and other tools to help solve them;
- Logically organizing and analyzing data;
- Representing data through abstractions such as models and simulations;
- Automating solutions through algorithmic thinking (a series of ordered steps);
- Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources; and
- Generalizing and transferring this problem solving process to a wide variety of problems (http://csta.acm.org/Curriculum/sub/CurrFiles/CompThinkingFlyer.pdf).

The recent curriculum developments that formed the impetus for the current report include a review of the information and communications technology (ICT) curriculum in the UK (The Royal Society, 2012) that identified a need for major reform and similar calls in the United States (Wilson, Sudol, Stephenson, & Stehlik, 2010; Cuny, 2012), Canada (http://cacsai.org/HowAlbertaGotCS) throughout Europe (Joint Informatics Europe & ACM Europe Working Group on Informatics Education, 2013), Australia (http://www.australiancurriculum.edu.au/technologies/digital-technologies/rationale) and New Zealand (Bell, Andreae & Robins, 2012). These initiatives emphasise refocusing Computing/ ICT education to incorporate Computer Science as the underlying subject discipline. In these countries where reform was recommended, curricula that had previously contained Computer Science had become weakened or diverted by other priorities. In other countries, such as Israel and Cyprus, Computer Science has been retained since its emergence in the 1980s. However even in countries that have maintained Computer Science, rationale for its presence in curricula and curricula themselves vary (Hazzan, Gal-Ezer, & Blum, 2008; Webb, Davis, Reynolds, & Syslo, 2015) and are worthy of scrutiny.

The economic imperative is a strong driver behind the recent refocusing on Computer Science in the USA and Europe (Joint Informatics Europe & ACM Europe Working Group on Informatics Education, 2013; The Royal Society, 2012; Wilson et al., 2010). At the same time many educators see the importance of people developing understanding of the capabilities and potential of technologies and being able to engage in “computational thinking” and other forms of thinking promoted by studying Computer Science, such as systems thinking, in order to support learning and create informed citizens. This new thinking and understanding is not the digital literacy whose importance is already well-established but a set of skills, understanding and thinking that can be developed by engaging with and understanding Computer Science; understanding how computers work and designing and creating computer-based solutions, including through programming.
Key challenges and issues

Table 1 summarises the main challenges and their solutions identified at EDUsummIT 2015 and indicates recommendations for policymakers (P), educators (E), industrial partners (I) and researchers (R). Evidence of these challenges and justification for solutions is outlined below.

1. **Lack of understanding of Computer Science/Informatics as an academic discipline**

   The nature of Computer Science as an academic discipline is relatively invariant across cultures, and a common definition¹ is widely accepted. However developments in Computer Science and consequent technological innovations are rapid, making it difficult for people to understand their importance and relevance. This rapid change also mitigates against clear understanding of the importance of Computer Science in the K-12 curriculum.

2. **A need for Computer Science/Informatics² as a distinct subject**

   The major rationales for including Computer Science in the K-12 curriculum as a distinct subject were outlined earlier in this paper as were the characteristics of computational thinking. Our recommendation for promoting computational thinking through learning Computer Science is based on the understanding that computational thinking is integral to problem-solving approaches in Computer Science (Wing, 2006). Furthermore, working with concepts from Computer Science and programming, which is not usually taught in other curriculum subjects, provide very practical ways to engage with computational thinking even for young children, for example, programming a robotic toy (such as the "Beebot") to follow forward/left/right movements to reach a destination. Computational thinking and other skills developed in Computer Science, including programming, can then be applied to other curriculum areas (see for example Barr & Stephenson, 2011).

3. **Computational thinking is difficult to implement in schools**

   As argued above, computational thinking involves developing ways of solving problems, designing systems, and understanding human behaviour that draws on concepts fundamental to computer science. However, large-scale studies of computer practices in schools (e.g., Voogt & Knezek, 2008; Plomp, Anderson, Law, & Quale, 2009) and earlier reviews (Cox & Abbott, 2004) have shown that within the current school curriculum teachers do not have sufficient time nor expertise to implement computational thinking. The addition of Computer Science as a distinct subject would lead to expert teachers in the field and the curriculum time for computational thinking to become an integral part of every child’s education.

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¹ This is a definition of Computer Science, which is widely accepted: “the scientific and practical approach to computation and its

² Informatics, which is a term used widely in education in Europe, incorporates Computer Science but is broader and encompasses the entire set of scientific concepts that make information technology possible (Joint Informatics Europe & ACM Europe Working Group on Informatics Education, 2013).
4. **The development of Computer Science/Informatics school curriculum is impeded by insufficient empirical evidence**

Defining a Computer Science appropriate curriculum structure and sequencing is challenging because there is less evidence of how students develop understanding of Computer Science compared with other subjects. However there are epistemological considerations and constraints which can guide curriculum design (Winch, 2013; Young, 2013). Furthermore, lessons from curriculum theory and from experiences of curriculum design in other subjects suggest that we need to live with uncertainty and to accept the need for a dynamic and continually renegotiated curriculum (Webb, 2014) and at the same time continue to research how students develop their understanding. In conjunction with specification of curriculum structure and sequencing there is a need for clear learning outcomes, assessments and standards for Computer Science/Informatics throughout K-12. Such clear specification should help to alleviate the problems of confusion that have contributed to the failure of integrated solutions for incorporating Computer Science/Informatics into the curriculum (Wilson et al., 2010). Therefore given the additional challenges of teacher professional development we recommend that a) in primary education, while it may well be integrated across the curriculum in its delivery, Computer Science is identified as a subject area with specialist support and b) in secondary schools Computer Science is taught as a separate subject by specialist teachers.

5. **Previous ICT curricula deliveries poorly prepared students for Computer Science/Informatics in further and higher education or professional employment**

Most countries have had national programmes and policies for many years regarding the incorporation and teaching of ICT in schools (Plomp et al., 2009). However, for many years national curricula, in many countries, have mainly focused on teaching basic computer skills such as word-processing, using email, drawing a graphics program, communication using Email and Chat and searching for information using the Internet (ibid.) and not the teaching of computational thinking which is a very important 21st century skill. A Computer Science curriculum would have this subject as its core and ensure all school pupils developed competence in it.

6. **Integrating Computer Science/Informatics across other subjects in the school curriculum has been ineffective**

In spite of enormous growth in the number of computers in schools and widespread access to the Internet, an international study of policies and practices of using ICT across the curriculum in 37 countries (Plomp et al., 2009) has concluded that the integration of ICT use into other school subjects such as science and mathematics, let alone the teaching of Computer Science, has been spasmodic and in many schools non-existent. For example in the United States in 2009, a leader in technological innovation, “Many of America’s 54 million elementary and secondary school students remain largely unaffected by existing technological infrastructure. Large numbers of teachers and students rarely touch a computer”. (Andersen & Dexter, 2009, p. 707).

7. **Teachers’ professional development in a newly introduced Computer Science/Informatics subject is a challenge in quality and quantity for many countries**

With the shift from ICT across the curriculum incorporated by teachers of a range of different curriculum subjects to a requirement for schools to deliver a CS/Informatics
curriculum there has been an urgent need to train existing and new teachers in this subject. To date, in most developed and developing countries there are insufficient specialist computing teachers to teach this curriculum in all schools (Webb, 2014).

8. Identifying and allocating the additional resources for teaching Computer Science/Informatics is a challenge

The challenge of providing appropriate resources for teaching Computer Science obviously varies between countries (Plomp et al., 2009) but there are ways of teaching many elements of Computer Science without using computers e.g. the "unplugged" approach (Bell & Newton, 2013) which can be engaging for students. However there are possibilities for new software resources for teaching Computer Science enabling improved or accelerated learning of difficult concepts. This is particularly evident in learning programming, which is generally regarded as difficult, but developments of tools for visualising programming, for example, can improve learning provided teachers understand their pedagogical significance (see Ben-Ari, 2013 for a review). Thus it was agreed that resource provision should not be a barrier to introducing Computer Science into the curriculum but making available a good range of resources and ensuring teachers are able to use them efficiently should be an ultimate goal.

Table 1

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solution/Recommendation to P, E, I, R</th>
</tr>
</thead>
</table>
| 1. Lack of clear understanding (outside the field of Computer Science) of Computer Science/Informatics as an academic discipline. | (a) Adopt a globally agreed statement of Computer Science/Informatics as a discipline in its own right (P, I, R, E).  
(b) Articulate the nature, importance and relevance of Computer Science/Informatics to society and education (P, I, R & E). |
| 2. A need for Computer Science/Informatics as a distinct subject in school curricula is controversial and poorly understood. | Disseminate and communicate a clear rationale to different stakeholders about the need to have Computer Science/Informatics as a distinct subject in school curricula (P, I, R & E). |
| 3. Computational thinking, a core component of Computer Science/Informatics, is considered to be important in 21st century skills, but due to its complexity, it is difficult to implement in schools. | Promote computational thinking through the means of a Computer Science/Informatics curriculum, which aims at making computational thinking commonplace (P, R & E). |
| 4. The development of Computer Science/Informatics school curricula is impeded by insufficient empirical evidence of student learning in order to support content definition and sequencing. | Design Computer Science/Informatics curricula based on a content analysis, and then continue to research students’ learning difficulties as well as the effects of different pedagogical approaches. (E & R). |
5. Previous ICT curricula deliveries poorly prepared students for Computer Science/Informatics in further/higher education or professional employment.

Facilitate better smart partnerships between education systems and industry/professional associations. (E & I)

6. Integrating Computer Science/Informatics across other subjects in school curricula has been ineffective.

Identify clear learning outcomes, assessments and standards for Computer Science/Informatics. (E, I, P & R)

7. Teacher professional development in a newly introduced Computer Science/Informatics subject is a challenge in quality and quantity for many countries.

a) Encourage more Computer Science/Informatics graduates to become teachers. (P, I & E)
b) Add a Computer Science/Informatics specialisation to pre-service training for primary school teachers. (P & I)
c) Make Computer Science/Informatics professional learning a requirement for periodic teacher re-accreditation/licensing. (P)
d) Schools need resource allocations to free teachers to undertake the professional learning and preparation for a new Computer Science/Informatics subject. (P)

8) Identifying and allocating the additional resources for teaching Computer Science/Informatics is a challenge.

(a) Some of Computer Science/Informatics can be taught without computers. But computers especially mobile devices can enhance the learning experience. (P, E, I & R)
(b) Teacher training needs to provide skills in using the available resources in the most efficient way. (E)
(c) Identify, and if not available, commission teaching support materials in mother-tongue language especially for younger students (P,E,I).

Key: Policy maker (P), Educator (E), Industry partners (I), Researcher (R)

While the order of challenges shown in Table 1 represents a logical progression for considering curriculum rationale and design, the order of priority and difficulty will vary across contexts. For example, currently teacher professional development is a major challenge for those countries that are introducing or re-introducing Computer Science.

Critical for global communications about these challenges is the issue of varying terminology used in different countries. Figure 1 offers a mapping of such diversity and the position of the elements of computing-related terms in relation to the conventional school curriculum.
Further issues that were addressed by other EDUsummIT working groups and are relevant to understanding of the roles of Computer Science/Informatics in the Curriculum include: 1) the interrelationships between curricula, pedagogy and assessment; 2) the relationship between formal and informal learning; 3) the need to take account of informal learning in assessment. Another issue, at a finer grained level of detail, that concerns policy makers and educators, is the choice of programming languages for learning. We agreed that it is the problem solving processes and design of algorithms that should take precedence over the learning of specific programming languages. However it was also agreed that program implementation, testing and debugging is essential and the choice of language affects learning opportunities and pedagogy. Furthermore the predominance of English as the basis for programming languages mirrors the wider tension between schooling in a child’s own language and the importance of accessing international material.

**Action plan**

The working group will:

1. Elaborate a detailed research paper on “Arguing for Computer Science in the School Curriculum” by building on this short paper and on research from past EDUsummITs and the International Handbook for Information Technology in Primary and Secondary Schools (Voogt & Knezek, 2008) and thematic working groups;
2. Develop a UNESCO Policy Paper on Advancing Understanding of the Role of Computer Science in the Curriculum;
3. Create two further research papers to address challenges and issues raised in this paper on a) the “Challenges for specifying structure and sequence in the Computer Science curriculum: the interrelations between resource issues and pedagogical approaches”; and b) “Defining Pedagogical Content Knowledge needed for primary and secondary teachers to teach Computer Science”;
4. Disseminate outcomes at various conferences including WERA at AERA 2016 and the next Edusummit2017; and
5. Inform national governments of the findings and recommendations.

References


Acknowledgements

Thanks to:

1. Contributors to EDUsummIT 2015 discussion paper on which this paper drew: Yousra Chouki, Al Akhawayn University in Ifrane, Morocco; Niki Davis & Tim Bell, University of Canterbury, Christchurch, New Zealand; Yaacov J Katz, il Michlala - Jerusalem Academic College and Bar-Ilan University, Israel; Nicholas Reynolds & Dianne P. Chambers, The University of Melbourne, Australia; and Maciej M. Syslo, University of Wroclaw and UMK, Toruń, Poland.

2. All attendees of EDUsummIT 2015 for review and suggestions.
## Appendix 1: EDUsummIT 2015 Steering committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwang Jo Kim</td>
<td>Summit Host</td>
<td>UNESCO</td>
</tr>
<tr>
<td>Jill Downie</td>
<td>Summit Host</td>
<td>Curtin University</td>
</tr>
<tr>
<td>Jonghwi Park</td>
<td>Summit Advisor &amp; AMFIE Liaison</td>
<td>UNESCO</td>
</tr>
<tr>
<td>Kwok-Wing Lai</td>
<td>Summit Co-Chair</td>
<td>University of Otago</td>
</tr>
<tr>
<td>David Gibson</td>
<td>Summit Co-Chair</td>
<td>Curtin University</td>
</tr>
<tr>
<td>Kinshuk</td>
<td>Editor, Educational Technology</td>
<td>Athabasca University</td>
</tr>
<tr>
<td>Joke Voogt</td>
<td>Founder &amp; Programme Advisor</td>
<td>University of Amsterdam</td>
</tr>
<tr>
<td>Gerald Knezek</td>
<td>Founder &amp; Programme Advisor</td>
<td>University of North Texas</td>
</tr>
<tr>
<td>Margaret Cox</td>
<td>Founder &amp; Programme Advisor</td>
<td>King’s College London</td>
</tr>
<tr>
<td>Tammie Burke</td>
<td>Summit Facilitator</td>
<td>Curtin University</td>
</tr>
</tbody>
</table>
Appendix 2: TWG Participants

TWG 1: Smart partnerships

Participants attending EDUsummIT
Deirdre Butler (Dublin City University)
Amina Charania (Tata Trusts & Tata Institute of Social Sciences, India)
Niki Davis (University of Canterbury, Convenor)
Margaret Leahy (Dublin City University, Leader)
Cathy Lewin (Manchester Metropolitan University, Leader)
Ave Mejia (UNESCO Bangkok)
Hasniza Nordin (Universiti Utara Malaysia)
Davor Orlec (IJS Jožef Stefan Institute, Slovenia)

Participants not attending EDUsummIT
Vanessa Chang (Curtin University)
Ola Erstad (University of Oslo, Leader)
Olatz Lopez-Fernandez (Catholic University of Louvain, Belgium)
Ben Daniel Motidyang (University of Otago)

TWG 2: Advancing mobile learning in formal and informal settings

Participants attending EDUsummIT
Rowland Baker (Santa Cruz County Office of Education, USA, Leader)
Linda Fang (Temasek Polytechnic, Singapore)
Kim Flintoff (Curtin University)
Feral Khaddage (Deakin University, Convenor)
Immo Kortelainen (Tampere University of Applied Sciences, Finland)
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Wolfgang Muller (University of Education Weingarten)
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Barry Quinn (King’s College London)
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Dolores Zambrano (Universidad Casa Grande, Ecuador)

Participants not attending EDUsummIT
Cathie Norris (University of Michigan, Leader)
Elliot Soloway (University of North Texas, Leader)

TWG 3: Professional development for policy makers, school leaders and teachers

Participants attending EDUsummIT
Peter Albion (University of Southern Queensland, Convenor)
Tony Brandenburg (ISTE)
Paul D’Souza (Somaiya College of Education & Research, India)
Alona Forkosh-Baruch (Tel Aviv University, Leader)
Martin Levins (Armidale School, Australia)
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Jo Tondeur (Ghent University, Leader)
Mun Fie Tsoi (MFR-Training & Consultancy, Singapore)
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John Wilson (Burapha University, Thailand)

Participants not attending EDUsummIT
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Anh Nguyen Ngoc (National Institute of Education, Viet Nam)
Sarah Prestridge (Griffith University)

TWG 4: Addressing gaps and promoting educational equity

Participants attending EDUsummIT
Manal Yazbak-Abu Ahmad (Sakhnin College, Israel)
Miron Bhowmik (UNESCO Bangkok)
Diana Gross (Global Citizen Educate)
Thérèse Laferrière (Université Laval, Canada, Convenor)
Don Passey (Lancaster University)
Janet Price (University of Tasmania)
Miri Shonfeld (Kibbutzim College of Education, Technology and the Arts & MOFET, Israel, Leader)

Participants not attending EDUsummIT
Julie Hoffman (Curtin University)
Assetou Kouraogo (Ministry of Education, Burkina Faso)
Mar Mbodj (Université Gaston Berger de St-Louis, Sénégal)
Allan Yuen (University of Hong Kong)

TWG 5: Assessment as, for, and of learning in the 21st century

Participants attending EDUsummIT
Christopher Deneen (National Institute of Education, Singapore)
Kulari Lokuge Dona (Swinburne University)
Koos Eichhorn (Lucas onderwijs, Netherlands)
Xiaoqing Gu (East China Normal University)
Ronghuai Huang (Beijing Normal University)
Jonathan San Diego (Kings College London)
Mike Spector (University of North Texas, Convenor)
Amali Warusavitara (Sri Lanka Institute of Advanced Technological Education)

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Dirk Ifenthaler (Curtin University, Leader)
Jiingyan Lu (University of Hong Kong)
Evode Mukama (University of Rwanda)
Youqun Ren (East China Normal University)
Demetrios Sampson (University of Piraeus, Leader)
Lan Yang (Hong Kong Institute of Education)
TWG 6: Creativity in a technology enhanced curriculum

Participants attending EDUsummIT
Miroslave Cernochova (Charles University, Czech Republic)
Janet Cochrane (Queensland Department of Education & Training)
Sue Cranmer (Lancaster University)
Sacha DeVelle (Australian Council for Educational Research)
Petra Fisser (Netherlands Institute for Curriculum Development, Leader)
Michael Henderson (Monash University)
Danah Henriksen (Arizona State University, Leader)
Leah Irving (Curtin University)
Eugenia Kovatcheva (State University of Library Studies and Information Technologies, Bulgaria)
Punya Mishra (Michigan State University, Convenor)
Paolo Tosato (Ca’ Foscari University of Venice)

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Susan Hopper (University of North Texas)
Don Krug (University of British Columbia)
Tim Patston (Geelong Grammar School)
Nicholas Reynolds (University of Melbourne, Leader)

TWG 7: Indicators of quality technology-enhanced teaching and learning

Participants attending EDUsummIT
Bent Andresen (Aarhus University, Denmark)
Tania Broadley (Curtin University)
Esther Care (University of Melbourne, Leader)
Rhonda Christensen (University of North Texas, Leader)
Allan Christie (Blackboard)
Jill Downie (Curtin University)
Pieter Hogenbirk (Odino Educational Management, Netherlands)
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Jonghwi Park (UNESCO Bangkok)
Linda Shear (SRI International, Leader)
David Smith (Kaplan University)
Louise Starkey (Victoria University of Wellington)
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Rosa Maria Bottino (Italian National Research Council)
Dianne Chambers (University of Notre Dame)
Peggy Ertmer (Purdue University)
Jutima Methaneethorn (Lampang Rajabhat University, Thailand)
Keryn Pratt (University of Otago)
Peter Twining (Open University, UK)
Shirley M C Yeung (Hang Seng Management College)
Sarah Younie (De Montfort University)
TWG 8: Digital citizenship and cyberwellness

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Eva Dobozy (Curtin University)
Devashish Dutta (UNICEF)
Marsali Hancock (iKeepSafe, Leader)
Hyunjeong Lee, (UNICEF)
Joyce Malyn-Smith (Education Development Center, USA)
Yuhyun Park (Nanyang Technological University)
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Leela Pradhan (University of Kathmandu)
Jongwon Seo (Korea Education & Research Information Service)
Ethel Valenzuela (SEAMEO INNOTECH, the Philippines)

TWG 9: Curriculum - Advancing understanding of the roles of CS/Informatics in the curriculum

Participants attending EDUsummIT
Charoula Angeli-Valanides (University of Cyprus)
Margaret Cox (King’s College London, Leader)
Andrew Fluck (University of Tasmania, Leader)
Joyce Malyn-Smith (Education Development Center, USA)
Joke Voogt (University of Amsterdam)
Mary Webb (King’s College London, Convenor)
Jason Zagami, (Griffith University, Australia)
Appendix 3: EDUsummIT 2015 Programme

### Sunday 13 September

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.30pm</td>
<td>Reception - Cocktail Menu</td>
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### Monday 14 September

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
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<tbody>
<tr>
<td>8.30 - 8.50am</td>
<td>Registration</td>
</tr>
<tr>
<td>9.00 - 10.15am</td>
<td><strong>Welcome</strong>, Ohm-Joo Kim, UNESCO &amp; Professor Jiyoon Do, Yonsei University</td>
</tr>
<tr>
<td>10.30 - 12.00am</td>
<td><strong>TWG Breakout Session 1 – What are the key challenges?</strong></td>
</tr>
<tr>
<td>12.00 - 13.00pm</td>
<td>Lunch</td>
</tr>
<tr>
<td>1.00 - 2.30pm</td>
<td>TWG Breakout Session 2 – How to resolve the challenges?</td>
</tr>
<tr>
<td>2.30 - 3.30pm</td>
<td>Afternoon Tea Break</td>
</tr>
<tr>
<td>3.30 - 4.30pm</td>
<td>TWG Breakout Session 3 – How to resolve the challenges?</td>
</tr>
<tr>
<td>4.30 - 5.30pm</td>
<td>Discussion of the next EDUsummIT</td>
</tr>
</tbody>
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### Tuesday 15 September

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 - 10.30am</td>
<td><strong>TWG Breakout Session 4 – Recommendations to policy makers, researchers and practitioners</strong></td>
</tr>
<tr>
<td>10.30 - 11.00am</td>
<td>Morning Tea Break</td>
</tr>
<tr>
<td>11.00 - 12.30pm</td>
<td>Cross-fertilisation, TWG Leaders rotate</td>
</tr>
<tr>
<td>12.30 - 1.30pm</td>
<td>Lunch</td>
</tr>
<tr>
<td>1.30 - 3.00pm</td>
<td><strong>TWG Breakout Session 5 – Preparation for Action Plan and Policy Report</strong></td>
</tr>
<tr>
<td>3.00 - 4.30pm</td>
<td>Plenary Session – Action Plans and Policy Briefs – TWG group reports</td>
</tr>
<tr>
<td>4.30 - 5.00pm</td>
<td>Closing Ceremony</td>
</tr>
<tr>
<td>5.00pm</td>
<td>Afternoon Tea</td>
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EDUsummIT 2015 Summary Report