The IFIP TC3 Dublin Declaration

Introduction

Every four years, the International Federation for Information Processing (IFIP) Technical Committee on Education (TC3) holds a World Conference on Computers in Education (WCCE). This significant event brings together researchers, policy makers and practitioners from across the world, to share the most recent research findings, policy concerns and focus, and examples of practitioners' interventions and needs. This event provides an important platform, both for gaining a view of the current situation and its contexts with regard to how digital technologies are being used across education (in primary, secondary, vocational, further, higher and adult education), and as a springboard for viewing possible futures based on the most up-to-date perspectives from research, policy and practice disciplines. This year, to support researchers, policy makers and practitioners, a Dublin Declaration has been created; a distillation of evidence, identifying key aspects of innovation, development, successes, concerns and interests, but also showing where less success has been achieved. Consequently, it offers recommendations for researchers, policy makers, developers and practitioners.

This Dublin Declaration is an important source for all those concerned with the development, deployment and uses of educational technologies. For researchers, the Dublin Declaration provides a view across current studies while also identifying gaps in our knowledge base. For policy makers, the Dublin Declaration shows the current focus of national and international concerns but also highlights those developments that are important for the future acquisition of digital capabilities and long-term skills. For developers, the Dublin Declaration highlights those innovations that are breaking new ground but also points to areas where gaps are evident. For practitioners, the Dublin Declaration provides examples of successful and effective practice while also offering ways to consider and develop new practices and pedagogies.

We hope that this Dublin Declaration will help with your endeavours, no matter what disciplinary area you are concerned with, and that you will look to take up the challenges presented here, in order to most effectively support the prospects of our learners, across the lifespan, and across society.

Professor Don Passey
Chair of the IFIP TC3 WCCE2017 International Programme Committee

IFIP TC3 DUBLIN DECLARATION
Tomorrow's Learning: Involving Everyone

Background

The IFIP WCCE 2017, organised by TC3 and hosted by the Irish Computer Society (ICS), took place in Dublin from the 3rd. to 6th. July 2017, with a doctoral consortium held on 2nd. July 2017.

The identification of key themes and trends from previous WCCEs led to the production of a series of recommendations, actions and visions. In 2005, the Stellenbosch Declaration called for actions to support digital solidarity, learners and lifelong learning, teachers and decision-making strategies, networking, and research. In 2009, the Bento Gonçalves Declaration called for actions to support the learner and teacher through curriculum initiatives, to develop research, learning environments, professionalism, and collaborative communities. İn 2013, the Torun Vision set out two key challenges for the future. The first was to move from consuming to innovating; to creating, conceptualising and producing using programming and computer science (CS), as well as using information and communication technology (ICT) applications. The second was to deploy digital technologies to better support different interactions with different stakeholders, according to technologies selected and used (such as those with online or haptic features), accommodating institutional diversities, gender, cultural, native language, cognitive and social backgrounds.

This Dublin Declaration from the IFIP WCCE 2017 is informed by the many presentations, discussions and interactions during the Conference from across the entire group of delegates. These researchers, policy-makers, educators, and ICT practitioners in education, from five continents, met and worked together in Dublin, Ireland.

Chairs of all sessions were asked to provide summaries, stating up to three key ideas for the future that were raised in their sessions (keynote presentations, paper presentations, symposia, and discussion sessions). Following the Conference, members of the International Programme Committee (IPC) collated these summary points. Key themes were drawn out, and contents were analysed and distilled within those themes. Draft versions were further shared with members of the IPC, with chairs of Conference sessions, and with all members of the four working groups of TC3. The resultant final version, this Declaration, provides an informed view from the width of conference delegates as to how they perceive the focus for necessary future action in this field of technologies supporting learning and education for all.

The Current and the Future

Participants in the Conference shared the belief that in terms of computing, computer education and uses of technologies for teaching and learning we are, in 2017, at a pivotal point of change. It is clear that international, national and local computer and educational technology strategies, policies and curricula are shifting. Earlier and ongoing outcomes from the activities of important initiatives such as the European Computer Driving Licence (ECDL) have clearly

contributed to this current state of play with regard to user practices and uses of ICT. The current status of computer access and uses across countries and the identification of key underlying development needs are clearly shown from the monitoring of international and national comparison data. For example, from the Programme for International Student Assessment (PISA) results run by the Organisation for Economic Cooperation and Development (OECD) and presented in the Conference; and from the International Association for the Evaluation of Educational Achievement's (IEA's) International Computer and Information Literacy Study (ICILS) focusing on computer and information literacy presented in previous IFIP TC3 conferences. Given the wide evidence base from a wealth of research studies and the outcomes presented throughout the Conference, learners of all ages and levels can benefit from, and should be enabled to develop opportunities that such technologies offer, not only for their individual futures but also for the future of our wider communities and society as a whole. However, young people need to have sufficient opportunities to be creators and not just consumers of ICT. The theme of the Conference was Tomorrow's Learning: Involving Everyone, which reflected a focal objective - to seek ways to assure the inclusiveness of technologies to support education, teaching and learning for all social groups. From the variety of opportunities presented, it is critical that teaching about computing does not replace the use of ICT to enhance learning across the curriculum, as ways in which ICT impacts on society and other aspects of digital literacy and digital agency (such as how to manage one's online presence) are fundamental knowledge for the current and the future. The balance between computing and ICT to enhance learning across the curriculum must be fully considered and accommodated. Importantly also, the balance between educational activities that involve non-computer use as well as computer use is an issue that needs wider consideration, as we move towards increased digital ubiquity in this digital era.

During the Conference, a large range of relevant contributions presented examples of practice of major importance and relevance, showing how improvement of education can be achieved through effective uses of technologies. Reviewing the entirety of evidence presented, we strongly recommend that stakeholders and decision-makers in education consider and invest in areas that Conference topics highlighted (detailed further in sections following), all of deep importance to the improvement of education through a consistent support of ICT. Following evidence supported by keynote presentations from policy perspectives, it is recommended that national investment is needed at a level of 7% of Gross Domestic Product (GDP) for education, compared to the current 5.2% as the OECD average. In addition, it was commonly agreed that for any strategy or policy in the educational arena to succeed, we must bring together contributions of researchers, policymakers and practitioners.

Computer Science Education

This was recognised widely as an area of growing and upmost importance. As we increasingly depend on well-educated professionals and digitally literate citizens, able to use computing and ICT in a broad set of circumstances and able to adapt in a flexible manner to a continuously changing technological environment, there are clearly implications for the social and economic sectors. Concerns were raised in this area; that we need far more research on aspects of inclusive curriculum, pedagogies and attitudes to computing, the need for more and well-trained computer science teachers, as well as the need for more professional educational support. In terms of economic drivers, there is need for any society to promote active producers rather than a society of passive consumers of technology, to create a wide set of computer scientists to sustain a competitive edge, and to have computer science-enabled professionals in all industries to support innovation. From a social point of view, computer science awareness provides opportunities to lead, create and innovate within society; and from a cultural perspective, it can be a powerful driver of cultural change. However, concerns have to be considered also; there is a trend towards starting computer science in the curriculum at a younger age, and this needs to be adequately supported by new programming environments that remove obstacles to learning, such as complex syntax. There is a need to look carefully at the conceptual basis of these approaches in order to develop important concepts for young learners through, for example, building procedures within Scratch (a widely-used programming environment for children) or through robotics (humanoid or handmade), as notions of procedural abstraction need to be integrated within curricular content, accommodating educational research in this field.

Our recommendations are:

- For an entitlement for young people to be educated in computing, incorporating computer science and computational thinking as the underlying academic discipline, as well as digital literacy - all young people have a right to become creators and not only consumers of ICT for their future.
- To enable more research into inclusive curriculum, pedagogies and attitudes to computing.
- To create more and well-trained computer science teachers.
- For more teacher professional educational support in integrating technology into lesson plans, and teaching across the curriculum, developing teachers as researchers in appropriate selection, design, implementation, reflection and dissemination of practice.
- To clarify use of terminology in this field, to ensure there is clear understanding whatever and wherever the audience is. Terms such as informatics, ICT, digitalisation, computers, etc., are often used indistinctly, although they are not interchangeable. A first pedagogical step should be to agree a common frame of terminology to avoid ambiguity or overlapping between different concepts.

Developing Countries

The gap between developing and developed countries in the use of ICT in education has not closed sufficiently to allow students from different parts of the globe to have the same opportunities to develop digital skills, competences and agency. The problem is becoming wider in some respects, because different groups of populations inside developing countries can have quite imbalanced access to technology. The differences between rural and city areas

and, within the latter, between inner city and the rest, means that an appropriate development of specific technology learning according to economic capacity of the different groups must be adequately considered.

Our recommendations are:

- To focus on new pedagogical opportunities offered by mobile learning applications and their adoption in the education field.
- To consider infrastructure challenges neither as a matter of funding nor as a technocratic approach; school administrators and parents should be included in developing creative support and maintenance, as part of a wider holistic approach to development.
- There should be co-operation with countries with a high degree of ICT development in education, to share their experience in IT usage/skills in the educational domain.
- Approaches implemented when using digital technologies to enhance learning in multicultural environments into developing countries should be considered for wider potential adoption, but with full consideration given to contextual differences and implications arising for adoption.

Inclusiveness and Student Engagement

Evidence shows that not enough didactic ICT-based resources have been developed for those with disabilities. This huge void should be more actively covered, enabling all to directly contribute to wider social welfare. Reducing the gender gap also constitutes an important concern for wider social development; there is a need to develop innovative and imaginative ways to attract more girls into computing. Technologies, in their varied applications, can show themselves as a powerful means to facilitate skills through activities that could be initially thought of as highly complex and demanding. In this way, innovative technologies should be used to facilitate more inclusive learning, reducing the gender gap and promoting student engagement.

Our recommendations are:

- To encourage schools to implement problems and ideas from real life and from students' out-of-school interests, activities and hobbies, to allow children to enjoy solving them in a challenging way, even in their free time.
- To focus curriculum design on the needs of all learners and not to over-emphasise the needs of those who will enter the computing profession; the key ideas and concepts of computer science should be made accessible to all students.
- To develop digital stories into the curriculum as a tool to engage young learners in active uses of ICT from early ages.
- To develop emotional intelligence of our students, as this is often a missing component of all virtual learning environments and other digital resources. The goal is to pay closer attention to implementing this aspect into pedagogies that involve educational software.
- To develop strategies to encourage the use of handheld devices in education to boost computer literacy.
- To commission research to understand why the gender gap is being reduced, according to some recent research studies.

Teacher Education and Continuing Professional Development

Experiences of how teaching staff in all educational sectors are currently teaching computing, and using and teaching ICT, emphasise the need to foster greater involvement of schoolteachers in the use of ICT as part of their regular teaching activities. Teachers should be aware that ICT can be more than a mere tool for superficial engagement of learners; they can aid the development of deeper engagement and thinking. This can be achieved by starting from a requirement to develop ICT-based resources themselves, rather than having them provided or modelled. Such uses will need to be adequately balanced with uses of ICT as pedagogical tools across the curriculum. There is a critical need to call the attention of policymakers as well as teacher educators and teachers to engage positively with the design and development of computing curricula in this changing world. Introducing ICT effectively into teaching and learning is often challenging because change will be necessary. It is, therefore, essential that all stakeholders are engaged in agreeing change - parents, governors, teaching staff and local and regional bodies as appropriate. In developing appropriate practices, where educators in ICT need to work with educational technology companies, practice-based research shows examples of how some companies have supported projects to meet educational agendas. Involving teachers in using ICT purposefully may be developed through communities of teachers within schools and in wider communities, where they can engage in well-organised practice-based research, sharing their results and aiming at a wider analysis of the evidence rather than being isolated in the classroom. Multimodal web publication can be an effective way of sharing evidence in a form that teachers are willing to access.

Our recommendations are:

- To develop educators who can teach computational thinking rather than just teaching programming from standard lesson plans and textbooks.
- To build further capacity in digitally-literate teachers in every discipline.
- To crucially provide professional development for teachers, which should be problem-based and adopt project-based approaches supported by and supplemented with communities of practice, as these provide enormous potential for effective professional development.
- To ensure that all stakeholders are engaged in developments that lead to change through ICT, even at the stage of discussing the evidence.
- To recognise the importance of learning analytics as potential instruments to improve learning processes, but considering the need for such data to provide useful and important feedback to improve educators' work.
- To spread more widely the proof of successful interventions in this domain, taking the context of evidence fully into account when considering relevance for different situations.
- To identify recognised instructional practices in online teacher education to provide effective and accessible professional development, expanding educators' knowledge for teaching with emerging technologies.
- To promote ways of developing communities of research-active teachers to develop and disseminate their own evidence of the impact of ICT on teaching and learning.

- To identify blended learning (online and face-to-face) as professional development opportunities for engaging teachers in practical experiences for teaching with technologies.

Game-Based Learning and Gamification

Games, available in a widening variety of formats and types, all used with different but relevant didactical approaches, promise to be important instructional tools. While this field is still at an embryonic stage, consequently, further theoretical discussions are needed to ensure a common use and understanding of the terminology and scope of these tools. Game-based learning is not just centred on the game and its immediate outcomes, but the challenge is to relate these to other instructional activities to achieve wider and longer-term learning objectives.

Our recommendations are:

- To promote further research to set the basis of a comprehensive framework to support game-based teaching and learning at all levels of education.
- To train pre-service and in-service teachers in the use of game-based learning approaches.

e-Evaluation

To see computers used effectively in education, it is necessary to develop fair, reliable and resilient computer-based assessment methods. Assessment methods must go far beyond imitating paper-based assessment, and prioritise the pedagogical affordances of computers over administrative convenience. The use of computers in timed, supervised assessments offers the chance to transform curricula in the light of computational thinking.

Our recommendations are:

- To consider stealth assessment as an approach to formative (rather than summative) assessment that is seamless - woven deep into the fabric of the activity such as a game and not taking away the ‘fun of learning’.
- To examine how the assessment approach from research can be taken into mainstream learning.
- To study the rapid rise in e-Examinations, for authentic assessment that matches modern workplace practices and many student learning experiences.

In Conclusion

For any of the topics above to be taken forward, they need to be afforded with greater levels of international cooperation and collaboration between researchers and practitioners, through appropriate research processes, from design to dissemination. In addition, research approaches in this field should continue to integrate and combine the expertise of education, psychology, sociology, computer science and economics to provide robust, well-rounded, critical perspectives to ensure the best outcomes to drive the future of education forward. High-quality interdisciplinary research is needed to establish a strong and informative evidence base before adopting large-scale implementation and investments in educational technology initiatives. An evidence base needs to assess the impact and integration of technology in the classroom through a synergy between quantitative and qualitative methods, where studies are framed in appropriate theoretical terms, with consistency between theoretical position, design,

methodology, data collection and analysis. Conceptions of research, policy and practice should be revisited in this field. Teachers need to be considered to be producers of knowledge. Maintaining the variety of uses for learners of all ages, identifying outcomes that relate to contexts, and measuring impacts where purpose and future developments are fully considered, are all essential elements that need to be integrated into contemporary and future research, policy, teacher education, teaching and learning practices in this field.

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The IPC of IFIP WCCE 2017, acknowledging the significant contributions of presenters and chairs of the Conference, and members of the working groups of TC3