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The Hon. Scott Morrison MP
Treasurer
BY EMAIL

19 January 2017

Dear Treasurer,

ACS PRE-BUDGET SUBMISSION: NATIONAL ICT EDUCATORS PROGRAM

The Australian Computer Society (ACS) is the professional association for Australia's ICT sector. We are pleased to make a pre-Budget submission in support of our proposed ICT Educators Program.

We seek \$10 million funding allocation in the upcoming Budget to establish and coordinate a national community for a professional ICT teaching practice over a three year period.

ICT Educators is a partnership between schools, universities, industry and professional bodies. It recognises the importance of local, face-to-face, peer-to-peer delivery, professional relationships and building the confidence of Australian teachers to implement the new Digital Technologies curriculum effectively.

The approach of ICT Educators, which is based on a successful British program, is school-led and responsive to local needs. It aims to inspire, motivate and support Australian primary and secondary school teachers by building a high-quality, low-cost, sustainable CPD infrastructure that nurtures long-term collaboration between teachers, schools and universities.

Our submission details:

- The objectives of ICT Educators
- How ICT Educators assists implementation of the new DT curriculum
- The successful British Model: *Network of Teaching Excellence in Computer Science*
- How ICT Educators would work
- Why the ACS? The role of the peak professional body
- The Broader Rationale for ICT Educators.

The ultimate aim of the ICT Educators Program is to deliver a significant improvement in the quantity and quality of students undertaking tertiary-level ICT education programs as pathways to professional ICT careers, boosting the national capacity for technological innovation and its commercial exploitation.

Please do not hesitate to contact me with any questions regarding our submission.

Yours faithfully,

[signed]

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AUSTRALIAN COMPUTER SOCIETY PRE-BUDGET SUBMISSION: ICT EDUCATORS

As the peak ICT professional association in Australia, the Australian Computer Society (ACS) seeks a \$10 million allocation in the 2017 Budget (for the 2017-18 Budget and forward estimates) for the ICT Educators Program: an overarching national initiative to boost the capacity of Australian primary and secondary school teachers to implement the ACARA Digital Technologies (DT) curriculum.

The ICT Educators Program is closely modelled on the British Computer Society's (BCS) successful UK *Network of Teaching Excellence in Computer Science*, which has been in operation since 2014. The ICT Educators Program will, over a three-year term, establish and coordinate a teacher community of practice for a rapid roll-out of professional development programs to bridge the gap between teachers' current capabilities and the level required by the DT curriculum.

Coordinated by the ACS and working with existing partners over a three-year period, the ICT Educators Program will expedite and extend current Australian initiatives to meet international best practice, including the non-technical 'ICT professional' side of the curriculum.

The ultimate aim of the ICT Educators Program is to deliver a significant improvement in the quantity and quality of students undertaking tertiary-level ICT education programs as pathways to professional ICT careers, boosting the national capacity for technological innovation and its commercial exploitation.

Objectives of ICT Educators

- In the short-term, lift the ability of teachers to deliver engaging classroom lessons on computational thinking, using the best available global resources curated against the new DT curriculum.
- Strengthen the dwindling pipeline of Australian students able to compete in the rapidly approaching digital and knowledge economies.
- Arrest the decline in the performance of Australian students in relation to Science and Mathematics¹.

Implementing the Australian DT Curriculum

The need to ensure that ICT teaching in Australia is technically up-to-date, focussed, practical and consistently meets benchmark standards at schools around the nation was reflected in the adoption by Australian education ministers of the DT Curriculum in 2015.

The DT Curriculum provides a technical emphasis on the discipline of Computer Science, but combines this with wider socio-professional aspects of ICT development and application. It focuses on ICT as an academic discipline in its own right ('teaching the technology'), not merely as a skill to be applied in other disciplines ('teaching with technology').

While teaching the technology is the core focus of the ICT Educators Program, it also facilitates the teaching of other disciplines with technology. In this way, there is a multiplier effect to effective ICT education.

The great opportunity presented by the national roll out of the DT curriculum requires effective implementation by teachers. There are two major aspects to this.

¹ Results from 2015 Programme for International Student Assessment (PISA)



Firstly, teachers need to meet the technical requirements of the curriculum. By extending ICT teaching across more levels of education (and with extension to 11-12 realistically anticipated), the DT curriculum makes greater demands on the ICT skills of teachers.

A second requirement is to stimulate interest in ICT learning and careers. However, this psychological dimension of the teaching program is not addressed by the DT curriculum, although it is heavily influenced by the style and quality of ICT teaching.

A number of Australian initiatives exist which are designed to enhance ICT school education and drive stronger interest in ICT careers and tertiary programs. They include the University of Adelaide DT MOOC (in cooperation with Google Australia) and Google Australia's *Start with Code* as well as *CSIRO Scientists and Mathematician in Schools*. There is also the NICTA Digital Careers Initiative, Code Club and CoderDojo.

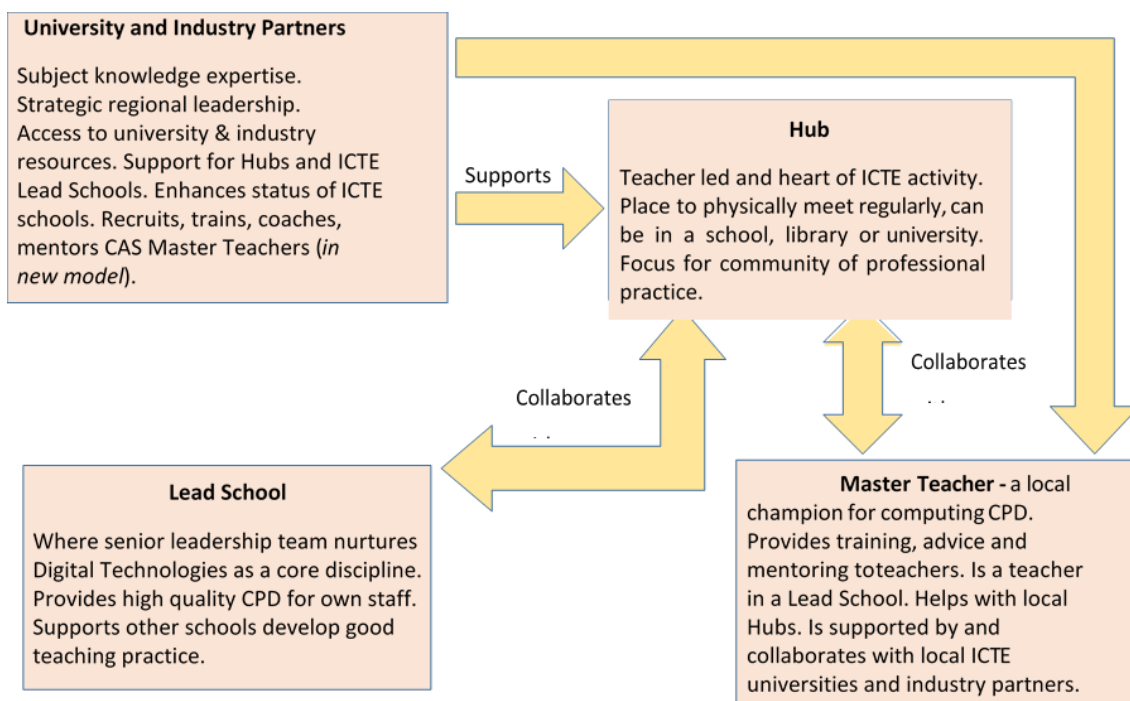
While these pre-existing programs are valuable, the major impetus for a national, holistic program comes from the need to implement the DT Curriculum around Australia.

As the peak professional body for ICT professionals in Australia, the ACS is among a number of stakeholders, including the Australian Council for Computers in Education (ACCE), CSIRO Education, the Australian Principals Association (APPA) and the Australian Library & Information Association (ALIA), currently working with ACARA as it begins to develop programs to support the implementation of the DT Curriculum.

A PILOT FOR ICT EDUCATORS: THE BRITISH MODEL

Between September 2013 and April 2015, the British Department for Education provided a direct grant to the grassroots network, Computing At School (CaS), to run a professional development program in ICT for teachers, both primary and secondary: *The Network of Teaching Excellence in Computer Science* (NoE). The purpose of the DoE grant was to facilitate the introduction of the new UK computing curriculum.

The NoE program is coordinated and managed under the auspices of the British Computer Society (BCS). It has four separate but interlinked strands of activity within a Regional Centre: University & Industry Partners, Lead Schools, Master Teachers and Local Hubs.



Strong Results – Measuring Success

In Britain, the Computing at School network now stands at more than **25,000 teachers**. As part of the NoE, there are currently **411 secondary and primary Master Teachers** and over **1600 registered schools**, of which 540 are Lead Schools. More than 3,800 professional development resources are available.

Extensive work has been undertaken to measure and track the impact of the NoE initiative². In the relatively short period since its inception, teachers have reported increased confidence, knowledge and skills, as well as significant impact on student attitudes towards ICT and learning. Particularly valuable aspects of the program include the:

- Speed of response to changes in the curriculum
- Approachability, commitment and mix of expertise of Master Teachers
- Quality, availability and flexibility of PD courses
- Face to face CaS Hub meetings to network with other teachers.

² For further information see: <http://academy.bcs.org/content/network-teaching-excellence-computer-science>.



HOW ICT EDUCATORS WORKS

ACS is proposing an Australian equivalent of the British *Network of Teaching Excellence in Computer Science*: the ICT Educators Program. The constituent parts of ICT Educators are as follows:

University & Industry Partners: Under the UK model, currently there are 10 university-led Regional Centres. These Centres bring academic strength and rigour to the network and increase the attractiveness of events and activities to teachers in each region. Industry partners work with the universities to strengthen, reinforce and complement this academic strength.

By providing a centre of activity around which other local/regional initiatives can cluster, and with which they can be aligned, the university and industry partners allow the ICT Educators Program to benefit from the existing networks and relationships that they have each developed over time and to leverage other relevant activities being run by them.

The University & Industry-led Regional Centres are responsible for:

- providing the catalyst for generating teacher engagement with digital technologies across their region
- providing leadership and coordination of activity at a regional level
- supporting teacher CPD through large scale events and by encouraging university, industry and school links (eg. undergraduates working in local schools)
- providing further CPD and support to their Master Teachers
- facilitating face-to-face mentoring and coaching opportunities for Master Teachers
- developing and sharing best practice locally and sharing across the network, and
- adding value to the network via links with existing activities/relationships.

Lead Schools: Lead Schools publicly recognise Digital Technologies as an important curriculum subject and include it as part of their school development plan, with clear and strong support and advocacy from their Principals. It is expected that a Lead School would be proactively developing a broad and balanced DT curriculum that shows clear, planned progression and thus have teachers who can become Master Teachers (see below).

A Lead School would also volunteer to offer support to at least one other school in their area through sharing of good practice e.g. team teaching, lesson observations, shared schemes of work or running joint planning sessions. Lead Schools would be self-nominating but would be required to complete an activity audit each year in order to maintain their Lead School status. There are currently 584 Lead Schools in the UK.

Master Teachers: Master Teachers are those who can demonstrate depth of subject knowledge coupled with extensive experience in the teaching of Digital Technologies. They are generally teachers who have followed an approved university provided CPD program to develop their subject knowledge, their understanding of pedagogy and their skills as a deliverer of CPD to other teachers. Master Teachers would provide local, on the ground face to face support to other teachers in their area.

Examples of the type of CPD Master Teachers have provided in the UK include running more formal CPD events, mentoring/coaching others, providing or recommending tried and tested teaching resources and presenting at local Hub meetings.



The Master Teachers are critical to the ICT Educators ecosystem, acting as a volunteer field force providing 'on the ground' support to other teachers in their areas.

Local Hubs: The core building block for the ICT Educators Program. They would be organised and led by teachers with assistance from the ACS, as detailed below. They would meet once/twice a term to share good practice, discuss PD opportunities and share experiences. The Hubs would be aimed at providing teachers who attend with ideas and concepts that can be used in the classroom. There are currently 186 active hubs in the UK.

The ICT Educators Secretariat

The ICT Educators Program would be established and coordinated by a small team over an initial three-year period, supported by the existing relationships and expertise of the ACS:

National Lead Coordinator (one funded FTE): Ensures there is national coordination of leadership, vision, advocacy and strategy for schools, universities, employers and other stakeholders. They will also manage the central team as well as budgets, and ensure the Program achieves the necessary KPIs. Requires leadership skills to work with volunteers who freely provide the vast majority of the motive force that will make the ICT Educators Program succeed.

National CPD Coordinator (one funded FTE): Ensures CPD provision from Lead Universities, Lead Schools, Master Teachers and Hubs is coherent, meets the strategic needs of schools at a national level and is properly coordinated between different organisations and stakeholders. They will also work collaboratively with Lead Universities to ensure they are fulfilling their obligations and providing optimal support to the local ICT teacher community. This will involve regular on-site visits to universities (not just Lead Universities), Lead Schools, and Hubs.

National CPD Deputy Coordinator (one funded FTE): The scale, growth and national reach of the growing ICT Educators network will necessitate a deputy. They will report to the CPD Coordinator and as the title suggests act as the deputy for the CPD Coordinator.

National Coordinator for Pedagogy (one funded FTE): This position works with all of the ICT Educators stakeholders to identify good pedagogy, synthesise it into a form that translates across the various different educational environments around the nation. One size does not fit all, so this work will involve understanding how principles of good pedagogy can be extracted from on-the-ground teaching practice and showing how those principles can be applied in different school environments. The role will also disseminate best practice to schools and universities and support and encourage the development of innovative, evidence based computing pedagogy that demonstrably improves learning outcomes for students. This role will work in close collaboration with the National CPD Coordinator to ensure good practice informs the CPD provision and training provided by ICT Educators partners.

The ACS is able to support the ICT Educators Program with technical, professional development and communications professionals to ensure the ongoing success of the initiative.



WHY THE ACS? THE PEAK PROFESSIONAL BODY FOR ICT

The ACS has the ICT expertise, the national presence and the network of relationships on which to establish and upscale a successful ICT Educators Program. Through our British counterpart, the BCS, we have the knowhow to implement ICT Educators quickly and effectively.

The ACS is the professional body for ICT in Australia with almost 23,000 members across the country. We are passionate about the ICT profession being recognised as a driver of productivity, innovation, and business – able to deliver real, tangible outcomes.

As outlined in our charter, the core function of the ACS is to ‘promote the development of Australian ICT resources’ and ‘further the study, science and application of ICT’. As a not-for-profit organisation, ACS has no commercial conflicts of interest that other for-profit organisations may have.

The ACS is able to offer a truly national presence (city, regional and remote) through a mix of the ACS offices in every State and Territory and a partnership with the Australian Library & Information Association (ALIA).

The ACS has ongoing and well-established relationships with all Australian universities through a combination of its role as the accrediting body for IT degrees and through its membership, and current Chairmanship of, the Australian Council of Deans of ICT.

We also have increasingly strong relationships with the corporate world and the IT industry through its steadily growing Professional Partners Program (PPP). PPP membership is currently around 300 and includes a mix of ASX top 100 companies as well as Federal and State Government Departments and agencies.

We have longstanding ties with our sister body, the BCS. The BCS is strongly committed to working with the ACS to establish ICT Educators in Australia.



THE BROADER RATIONALE FOR ICT EDUCATORS

There are around 628,000 ICT workers in Australia, with more than half employed outside of ICT-related industries, such as in professional services, public administration and financial services.

It is estimated that 44% of jobs in Australia are potentially at risk of computerisation and automation. The contribution of digital technologies to the Australian economy is on track to grow from \$79 billion in 2014 to \$139 billion in 2020, increasing from 5% to 7% of Australia's GDP. The vast majority of this growth (97%) is expected to take place in sectors outside of the traditional Information, Media and Telecommunications industry, meaning that all industries are at risk.

There is therefore a rising bar in education in the digital era. Upper secondary education is becoming a prerequisite for entering the labour market: the number of jobs available for highly-skilled labour is projected to more than double in 2019, compared with 1991.

Science, technology, engineering and mathematics (STEM) knowledge is associated with 75 per cent of the fastest growing occupations, innovations and wage premiums. However, Australian youth demonstrate falling interest and performance in STEM. Today 11 per cent fewer year 12 students study maths than in 1992, and there has been a 35 per cent drop in domestic enrolment in information technology subjects at universities since 2001.

Australians are likely to face increasing competition, as the number of people with tertiary education is rapidly growing globally. In 2012 every third adult in OECD countries had a tertiary degree. By 2030 China and India are expected to provide nearly half of the tertiary educated people aged 25-34 and over 60 per cent of the STEM qualified workforce for G20 countries.

From a demographic perspective, Australia's population and workforce are ageing. Nearly one in five Australians is expected to be over 65 years old in 2035, compared with one-sixth of the population today. Nearly two thirds of the population could become dependent on those in the labour force by 2046.

The National Innovation & Science Agenda: Talent & Skills

The Turnbull Government has been a strong advocate for the diversification of the Australian economy away from its reliance on customary wealth creators and towards building the national capacity for innovation and commercialisation in knowledge-based STEM disciplines and industries.

The ICT Educators program address the 'Talent & Skills' pillar of the National Innovation & Science Agenda by supporting all Australian school students as they embrace the digital age. ICT in itself is an inherently STEM-based discipline, but just as importantly it is also a key enabler of other knowledge-based disciplines. In this respect, ICT education initiatives have a 'multiplier effect', working across a number of disciplines.

The effective delivery of the DT curriculum, as an enabler of improved quantity and quality of students enrolling in tertiary-level studies in ICT, is critical to the success of the National Innovation & Science Agenda.



Matching Supply & Demand: Talent & Skills

Demand for ICT professionals is rising strongly in Australia, yet currently Australia lacks a sufficient pipeline of suitably qualified professionals to populate the ICT industry and meet this demand.

Currently, there is low demand for tertiary-level (higher education/university) programs in ICT, as seen by:

- continuing low numbers of enrolments in ICT programs compared to earlier peak(s)
- low tertiary entrance requirements compared to other professional programs, and
- high attrition rates from tertiary programs.

The ICT Educators program seeks to lift the quality and quantity of Australian school-leavers choosing tertiary-level ICT programs and ICT careers. A key success factor will be the way the new DT curriculum is delivered.

Australian PISA Results

The most recent Programme for International Student Assessment (PISA) results are cause for concern. Despite record levels of Commonwealth investment in schools since 2003, Australian students' scientific literacy has declined by 17 points since 2006, with nine points of the decline in the last three years. Further, the results between different states and territories of Australia lack consistency.

The PISA results follow the 2015 Trends in International Mathematics and Science Study, which show that Australia's performance in science and maths has been stagnant for the past 20 years. There is an urgent need to tie schools' funding to measures that will lift not only PISA results, particularly in STEM disciplines, but improve outcomes for all Australian school students.

The National STEM Education Strategy 2016-2026 and the roll out of the new DT Curriculum provides an opportunity for significant progress on this front.

National STEM Education Strategy 2016-2026

The National STEM Education Strategy sets out well the issues with improving STEM educational outcomes:

"There are many factors that affect student engagement in STEM. Underlying this are the views of the broader community – and parents in particular – about the relevance of STEM, and the approach to the teaching and learning of STEM from the early years and continuing throughout schooling. Connected to this is the way industry articulates the importance of STEM related-skills that extend beyond traditional STEM occupations. University admissions policies also have a strong influence on student choices in the senior secondary years." (page 3)

The Strategy identifies five areas for national action, the most directly relevant of which are:

- Increasing teacher capacity and STEM teaching quality
- Facilitating effective partnerships with tertiary education providers, business and industry.

The ICT Educators Program is a tried and tested model which fits the description of the Strategy's proposed *STEM Partnerships Forum*, the rationale of which is to:

'...facilitate more efficient and effective partnerships between schools, industry and the tertiary education sector that support teachers and develop the aspiration and capabilities of students, particularly for under-represented groups.'
