QUALITY OF INITIAL TEACHER EDUCATION IN NSW

DIGITAL LITERACY SKILLS AND LEARNING REPORT

A REPORT ON TEACHING INFORMATION AND COMMUNICATION TECHNOLOGIES IN INITIAL TEACHER EDUCATION IN NSW

NSW GOVERNMENT

GREAT TEACHING, INSPIRED LEARNING – A BLUEPRINT FOR ACTION
ACTION 3.1 – THE QUALITY OF INITIAL TEACHER EDUCATION PROGRAMS WILL BE ASSESSED AND PUBLICLY REPORTED ON AN ANNUAL BASIS

NSW EDUCATION STANDARDS AUTHORITY

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GREAT TEACHING, INSPIRED LEARNING – A BLUEPRINT FOR ACTION

Research shows that quality teachers are crucial for achieving an overall improvement in student learning outcomes.

In 2013, the NSW Government released *Great Teaching, Inspired Learning – a Blueprint for Action* (GTIL), which outlines 47 actions to improve the already high standards of teaching in NSW.

Responding to extensive community feedback about teaching quality, the plan includes actions to:

- better understand and share what makes an excellent teacher
- ensure beginning teachers are well suited and thoroughly prepared for the classroom
- make the Australian Professional Standards for Teachers (APST) central to delivering fair and accountable performance and accreditation processes and high quality professional development for all teachers
- ensure career pathways and improved support for school leaders.

The Blueprint is designed to help students to achieve better results by researching and sharing what makes an excellent teacher, and supporting the career long professional development of all teachers.

The NSW Education Standards Authority (NESA), the NSW Department of Education (DoE), the Catholic Education Commission NSW (CEC) and the Association of Independent School of NSW (AIS) are working together to implement the Blueprint's reforms across NSW.

Visit www.nswteachers.nsw.edu.au to find out how the Blueprint is improving the quality of teaching and student learning outcomes in NSW schools.

Figure 1: Inspired Learning Diagram

EXECUTIVE SUMMARY

The National Program Standards for Initial Teacher Education (ITE) require providers to show that graduates of their programs will meet the Graduate career stage of the Australian Professional Standards for Teachers. In addition, there are a number of priority areas in which all ITE graduates should develop skills and knowledge. Information and Communication Technologies (ICT) is one of the national priority areas and is the focus of this report.

This review of ICT in ITE programs, prompted by the recommendations of *Great Teaching, Inspired Learning: A blueprint for action* (GTIL), concentrated on current practice in preparing teacher education students in ICT curriculum content, pedagogy and the approach to integrating ICT across the learning areas. It examined the level of ICT expertise anticipated of graduate teachers (based on national and international standards) and investigated the aim of increasing digital literacy within ITE programs.

The review also explored potential gaps in ICT across current ITE programs, professional learning and development, the need for best practice exemplars, and a sustainable model for retaining resource material.

The digitalisation of the workplace, society and communications is undeniable, and the review argued that graduate teachers will not only need to be digitally literate but also capable of helping their future students move from being consumers of digital products to producers of digital solutions.

While it was evident there are opportunities to use and exercise digital literacies in every syllabus and in almost every situation, future teachers (and their supervisors) will equally need to be able to apply a balanced or indeed critical perspective when educating their students, as simply providing more ICT and more hardware is not the answer and could in fact be detrimental to student learning.

Knowing when to use ICT to improve learning and to learn digital competence and capability may be a refocus of teacher preparation.

A transition to the concept of digitally literate teachers and students will require some strategic planning.

PART 1: BACKGROUND

Introduction

The NSW Government adopted all the recommendations of *Great Teaching, Inspired Learning: A blueprint for action* (GTIL) in March 2013. The blueprint made recommendations for an annual process to review and report on different aspects of Initial Teacher Education (ITE) programs. In 2015, it was decided to review the teacher preparation programs in the national priority area of Information and Communication Technology (ICT). In NSW, ITE providers are required to demonstrate how the priority areas have been addressed in their applications for program accreditation. The priorities link directly to the Graduate career stage of the Australian Professional Standards for Teachers and the National Program Standards for Initial Teacher Education (APST).

The APST define the work of teachers and make explicit the elements of high-quality, effective teaching that will improve educational outcomes for students (BOSTES, 2015). The APST defines the knowledge, skills and attributes expected of teachers within the three domains of teaching across four career stages, beginning with graduate teachers. The standards that describe what graduate teachers should know and be able to do are the Graduate Teacher Standards (GTS).

ITE programs undergo a rigorous evaluation and assessment process in order to be accredited by the NSW Minister for Education. Accreditation recognises that the program provides graduates with the skills and knowledge required for entry into the teaching profession. In NSW, NESA assesses ITE programs against the National Program Standards which are set out in the *Accreditation of Initial Teacher Education Programs in Australia: Standards and Procedures*. This assessment requires that ITE providers demonstrate that their graduates will meet all of the GTS.

The ethical and responsible use of ICT in teaching, learning and administration are essential skills for classroom practitioners. In a rapidly changing digital world, broad ICT skills are increasingly identified as core knowledge. Efficient and broad use in teaching and learning is dictated by curriculum needs and by broader societal needs for the future as described in many recent reports. The use of ICTs in learning fosters motivation and engagement in students – it provides opportunity for better and broader engagement. The use of technology can help overcome inequity, disadvantage and disability. In administration, data analysis skills can enable the diagnosis and prognosis of student learning outcomes, individually and as large and small groups. This can assist in maximising learning outcomes and achievement for all students.

Graduate teachers who are classroom-ready will have an understanding of their subject(s), curriculum content and teaching strategies. They will be able to design programs and lessons that meet the requirements of curriculum, assessment and reporting. They will seamlessly integrate contemporary technologies including digital technologies into their teaching to benefit student learning (learning technologies). They will also utilise ICTs for classroom management and administration, and will be able to use data analytical tools to benefit student learning. They will be able to apply their ICT skills and competencies in encouraging their students to develop and produce digital products. Graduate teachers will see opportunity to educate about digital technologies in their teaching of all domains in their areas of learning. They will appreciate the ethical, moral and legal implications of ICT and associated use of personal data collection, copyright restrictions and privacy statements.

As they develop as teachers they will gain knowledge, skills and greater competence in the use of digital tools and how these tools can be used to enhance learning, through analysis, feedback, designing and producing digital solutions for themselves and their students. They will understand the digital world around them and appreciate its impact on every aspect of life. They will develop their own digital literacy along with that of their students.

Information and Communication Technologies defined

ICT is defined in the Australian Professional Standards for Teachers as:

> … the generation and application of knowledge and processes to develop devices, methods and systems (BOSTES, 2015).

NSW curriculum expands on this interpretation of ICTs and includes:

> *Integrating ICT capability*
> Students live in a rapidly changing technological world. Information and communication technology (ICT), including hardware and personal digital devices, software, and systems that manage, store, process, create, produce and communicate information, has become an important part of everyday life. The integration of ICT capabilities in teaching, learning and assessment in NSW syllabuses can lead to enhanced outcomes for students, and support the interactive process of teaching, learning and assessment in NSW schools required to develop the knowledge, skills, understanding, attitudes and behaviours to assist students to live and work successfully in the 21st century (BOSTES, 2014).

In Hague's holistic view of a successful 21st century citizen, he outlines that a high level of *digital literacy* is required and involves more than just *using* new technology:

> Digital literacy refers to the skills, knowledge and understanding required to use new technology and media to create and share meaning. Digital literacy also refers to the knowledge of how particular communication technologies affect the meanings they convey, and the ability to analyse and evaluate the knowledge available on the web. (Hague, 2011)

The skills, knowledge and understanding required to use technology (defined as digital literacy) is therefore a significant consideration of this report.

Further strengthening the all-encompassing concept of digital literacy was the 2016 Australian Government's Literacy and Numeracy Week definition:

> Digital literacy involves knowing how to use a range of technologies to find information, solve problems or complete tasks. Digital literacy is also about knowing how to act safely and respectfully online. (Australian Government, 2016)

The Australian Government also recently announced a grant offering to improve digital literacy in schools – another example of the growing movement to provide a clearer and more precise picture of what information and communication technologies has become. The grants are designed to support schools and help teachers demonstrate new methods for enhancing digital literacy in schools. In the statement announcing the grants, a point is made about all children needing to be digitally literate and ready for a future full of technology.

A shift from the use of ICT as a term for engaging with digital technology to the use of digital literacy will broaden the understanding of those involved in ITE. It develops an approach sometimes now referred to as 'CS + X' (Computing Science plus the variable 'X' which can be replaced by any field of endeavour). Computing and digital technologies are now so ubiquitous that they can apply in any field, in a broad range of contexts, beyond a specified syllabus outcome.

Recommendation 1

NESA, in consultation with ITE providers and employing authorities, will review current ITE requirements in ICT to identify how the broader concept of digital literacy can be incorporated. The work will consider what digitally literate graduate teachers should know and be able to do.

Overview

The first part of this report provides an overview of the evidence submitted by ITE providers to demonstrate how programs address the GTS in relation to ICT for program accreditation purposes. ITE providers submit documentation to provide evidence of how their graduates will meet each of the 46 GTS every five years for continuing program accreditation. To provide some background to this report, NESA officers reviewed the descriptions of where each ITE provider covers GTS 1.2.1, 2.6.1, 3.4.1 and 4.5.1 within their program(s). The following information is an analysis of those statements which provide an insight into the way ICT is covered within ITE in NSW. The evidence submitted by ITE providers is not designed to identify every instance where a topic is covered within the program, but to advise an assessment panel of some clear and explicit evidence of where an ITE student will be taught and assessed on that topic.

Consequently, the information herein is not an exhaustive analysis of how the learning to use, opportunity to use or explicit teaching of ICT is covered within ITE programs. The purpose of this background information is rather to present a summary of what providers determine to be significant evidence of where in their programs they address ICT content and its application to teaching, learning, assessment and administration.

The second part of the report sets out curriculum requirements specified by NESA with reference to the overarching statements regarding ICT capability. This is reinforced by recent work regarding digital disruption and 21st century workplace change. The report concentrates on NESA syllabus requirements, guidelines, practices and key elements, as these specify the ICT expectations the majority of teacher education graduates in NSW are required to implement.

The concluding sections of the report bring together data about the ICT readiness of Australian schools and international directions in the use of ICTs in teacher education to provide some opportunities for ITE providers when reviewing programs.

Context for the report

Depending on the courses studied, ITE students may experience different orientations and emphases during their learning in and use of ICTs. This report has concentrated on identifying the threshold outcomes for beginning teachers that will provide a good foundation for their initial classroom practice and further professional growth, irrespective of whether they are training as primary or secondary teachers.

The report focuses on ICT requirements for teachers of all mandatory subjects and does not reflect the specific requirements of ITE provision in the Technology learning area and in the delivery of computing specialised curriculum such as software design, multimedia education, 3D modelling and simulation, and CADCAM, now common in schools.

The evidence submitted by ITE providers should demonstrate, for program accreditation purposes, how their programs align with the outcomes addressing the Graduate Teacher Standards (GTS) in ICTs.

GTIL Action 3.1 is a commitment to ensure that ITE programs prepare graduates to integrate ICT into administration, teaching and learning. This paper identifies elements of content, and provides a range of national and international perspectives to help prepare ITE students to meet the following GTS 1.2.1, 2.6.1, 3.4.1 and 4.5.1 regarding ICT:

1.2.1 Demonstrate knowledge and understanding of research into how students learn and the implications for teaching.

2.6.1 Implement teaching strategies for using ICT to expand curriculum learning opportunities for students.

3.4.1 Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning.

4.5.1 Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching.

Expert panel

In preparation of this report an expert panel of educators was convened. It comprised of the NESA review team (including the NESA Technology Education Inspector), ICT education representatives from each of the schooling sectors, the NSW Council of Deans of Education, the Office of the Chief Scientist, experienced ICT teachers and ITE representatives. Panel members were provided with a background paper which summarised current ICT practices across ITE and perspectives in international ICT practices and raised some questions regarding the adequacy of current program accreditation requirements.

The expert panel formed a crucial element of the review by providing educational expertise to develop recommendations that improve and enhance ITE programs in the area of ICT instruction.

The expert panel discussed how the progression of technological change made it difficult to "keep up" and that alternative approaches embedding technical competence in a more fluid and flexible manner was desired. The panel agreed that ITE providers must avoid teaching specific skills that may be out of date by the time ITE graduates began their teaching careers. A preference to a digital literacy approach where ICT fundamentals are embedded into ITE programs and confidence is lifted was discussed during the meeting.

The expert panel recognised the importance of collaboration between ITE providers, schools and NESA in ensuring the digital competence of beginning teachers. The panel expressed their support for continuing the discussion regarding the impact of teacher education students' digital competence after they graduate.

PART 2: OVERVIEW OF ICT IN ITE PROGRAMS

To understand current practice in ICT preparation, NESA examined program accreditation documents submitted by ITE providers and consulted with their nominated representatives.

The report does not attempt to address particular strategies associated with specific teaching disciplines or specialised studies. Its focus is on mandatory school curriculum and ICT across the learning areas. The ICT capability is a cross-curriculum learning priority within NSW syllabus documents.

The review of the program evidence shows most of the primary and secondary ITE programs appear to follow a common approach of integrating the use, instruction and assessment of ICT across a range of units with ITE students given the opportunity to apply this practice during professional experience placements. The expert panel felt that the opportunity to exercise the students' ICT capability during the professional placement was beneficial to both student and school and that ITE providers should encourage placements to impart such opportunity.

A very broad range of contemporary ICT tools are utilised in programs, from web-based tools for searching and creation of content, through to multimedia digital products to facilitate learning by students. Additional content on ICT practice is provided in some programs through a dedicated unit on computing, coding, technical skills in the use of software or use of the internet in teaching (more common in secondary programs). Some providers indicate they include instruction on ICT within education theory and pedagogy units, others in stand-alone classes within programs to meet the specific needs of NSW syllabuses. These units introduce students to the concept of using ICT in the classroom through analysing academic research in this area, examining specific ICT tools that can be used in the classroom, and looking at issues and ethical questions relevant to ICT in schools such as cyber-bullying, plagiarism and privacy.

The nature of tertiary education in the 21st century means ITE providers have high ICT expectations of students such as submitting assignments online, participation in online forums, creation of digital portfolios and in many cases the creation of "digital learning objects" up to and including podcasting, Claymation, animation, video, virtual reality and augmented reality applications. Online learning is common in all degree programs, more so in those that have student populations from remote locations. University lecturers and course managers have developed sophisticated ICT skills to develop audio, video and interactive content. Students are also referred to publicly available online content at Khan Academy, iTunesU, YouTube and the like. Few ITE providers teach students the specific technical skills to emulate the tools and systems they utilise in their university learning.

Most present a task requiring ICT capability with accompanying directions to where support may be available in terms of online learning, for example by viewing a YouTube clip, peer teaching or in some cases, extra classes of a voluntary nature.

E-learning is common with all providers placing work in one form or another in content management systems (CMS). No provider teaches mandatorily the explicit skills of establishing and managing a CMS such as Moodle.

The modelling of ICT use is common – undergraduate lecturers use contemporary pedagogies and model good ICT practice with hybrid learning, interactive whiteboards, data projection and video with flipped classroom teaching styles.

The ethical and responsible use of ICTs is prominent in all courses, which cover copyright and plagiarism. Some providers assign a "hurdle task" of completing an induction into appropriate, ethical and intelligent online use – sometimes offered by external agencies and resulting in separate certification.

Online collaboration and interaction via blogs, wikis, email and instant messaging (IM) is encouraged in terms of aiding the development of professional connections. There was no formal evidence that these learning communities drew upon international connections. The ubiquitous nature of digital technologies in all jurisdictions, its ability to improve equity through the lowering costs of use and implementation means it is a topic of research in all countries. ITE students will gain a broader ethical and responsible understanding if exposed to the work of other education systems, through for example the Organisation for Economic Co-operation and Development (OECD), World Bank and European Commission. International connections can help students' further growth and aid in the appropriate delivery and use of ICTs as an enabler in all cultures. Some ITE programs include reference to international standards but students (who may well be from overseas) could add to their own knowledge and experience with national and international connections. Access to our own diverse cultures and especially to our Indigenous cultures can lead to an empathic and deeper understanding of the challenges and opportunities present in remote and differently enabled technology implementations.

Software evaluation for the purpose of supporting teaching is common as is critiquing of Apps appropriate to tablet use. Mobile digital literacy is in the mind of some providers as students in schools are now able to access information any place, any time.

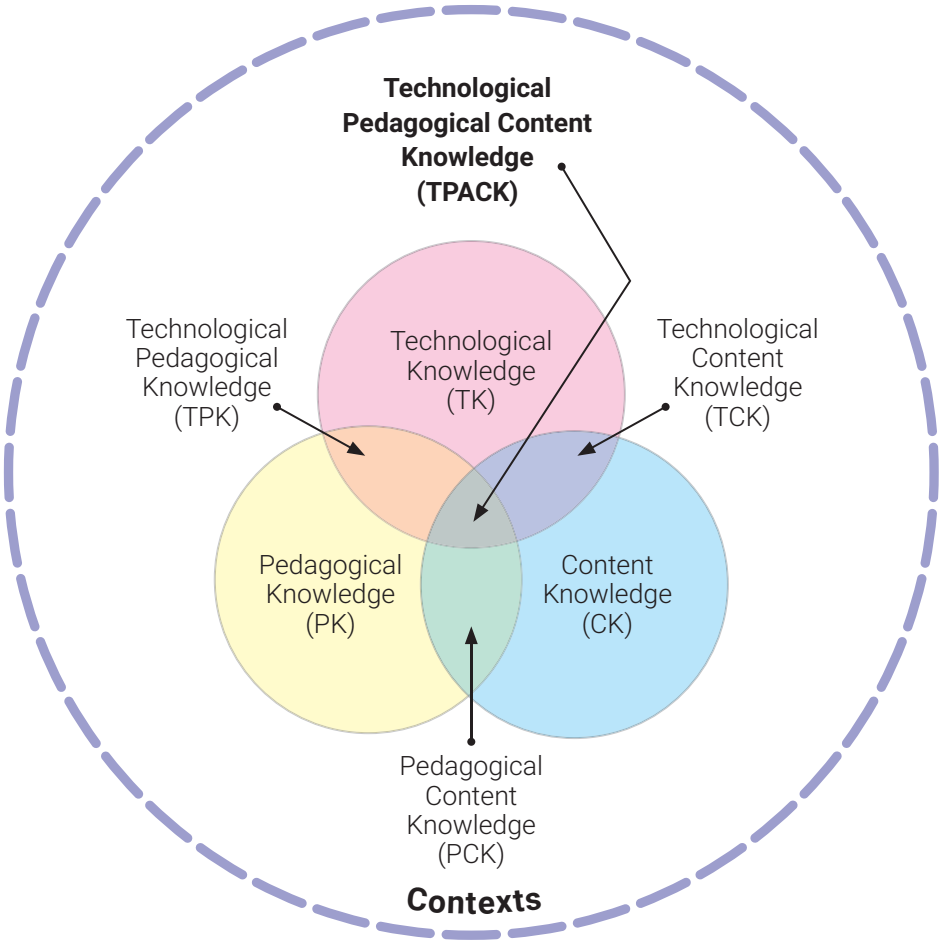
Making a digital product other than a media product was not evident. 3D printing, robotics and control technology are not evident in the education of teachers of the mandatory subjects.

Some include game-making and game theory to engage and encourage learning. Design thinking in the sense of the Universal Design for Learning (UDL) is also evident (National Center on Universal Design for Learning, 2015).

Though ITE providers teach using a broad range of ICT capability, there was less evidence that teaching *how* to teach ICT to school students was present.

Providers also engage students in the use of digital technologies for assessment and student management. However, data tools currently used by schools such as the Schools Analysis Package (SAP) from NESA is not readily available to providers. In interview, several providers reported that their work with students on data analysis for learning would be enhanced if they had access to the tools used in schools. SAP was specifically mentioned as an excellent tool available to teachers that could be utilised in ITE programs. Many reported that access to this in some form would be beneficial.

Many providers referred to their use of the Technological Pedagogical Content Knowledge (TPACK) model, as recommended by the Teaching Teachers for the Future (TTF) Project (Australian Council of Deans of Education, 2012). TPACK identifies the knowledge teachers need to teach effectively with technology.



Source: http://tpack.org Reprinted with permission.

At the heart of the TPACK framework is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK) and Technology (TK). The TPACK approach goes beyond seeing these three knowledge bases in isolation. TPACK also emphasises the new kinds of knowledge that lie at the intersections between them, representing four more knowledge bases teachers apply to teaching with technology: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the intersection of all three circles, Technological Pedagogical Content Knowledge (TPACK).

Providers indicated the use of TPACK enhanced understanding so students may be innovative and successful teachers in the future. This related to subject specific needs and a general capability approach to the integration of ICT. However, it became clear during research for this review that TPACK was considered no longer sufficient for the complete study of ICTs.

In discussions with providers, there was also mention of the Substitution Augmentation Modification Redefinition (SAMR) model being used. In this model, the educator designs a task that has significant impact on student outcomes and the process involves what can be viewed as "design thinking". The use of ICT tools to *substitute* for pen and paper is a low level example; understanding that word processing software can create an automatic table of contents is an example of *augmentation*. Further, sharing the notes with others via a blog is *modification* and *redefinition* would be to use the notes in a collaborative online mind map allowing input and improvement from others.

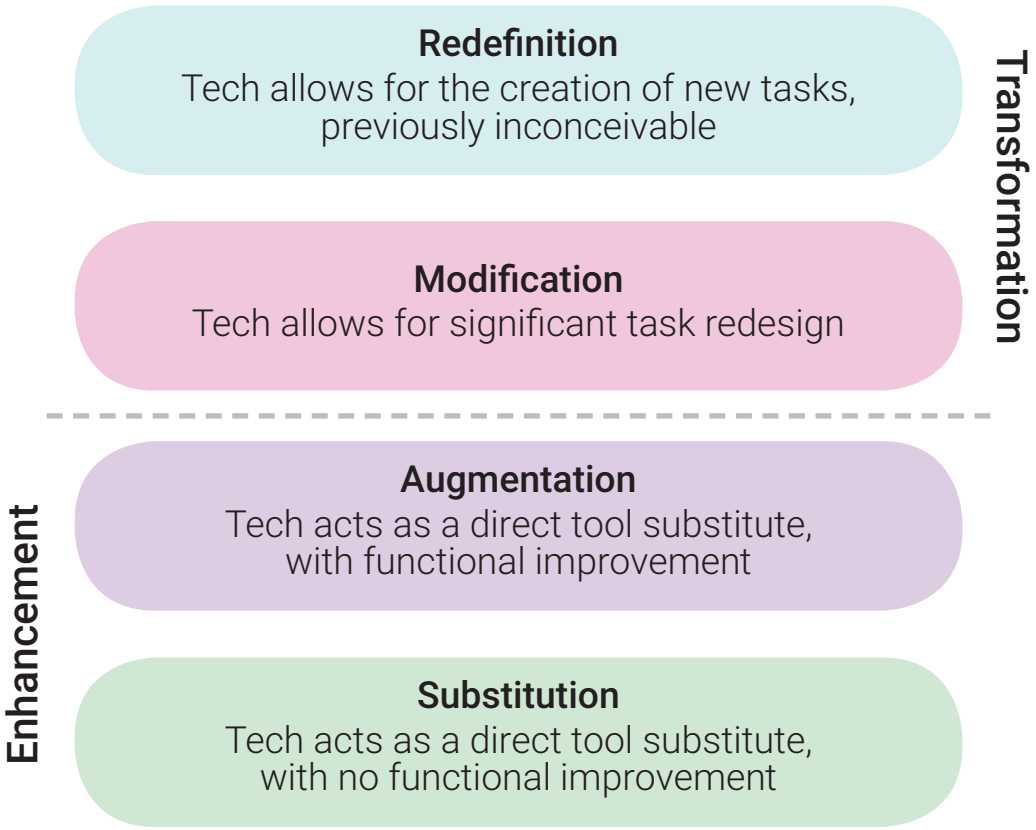


Image the creation of Dr. Ruben Puentedura, Ph.D. http://www.hippasus.com/rrpweblog

Both TPACK and SAMR are used in programs to help ITE students place ICT in context and provide a framework for constructing lessons. They are presented to students in workshops where they then have the time to explore a range of technologies often including mobile, flipped classrooms, interactive teaching, 1:1 learning and Bring Your Own Device (BYOD) scenarios. They are also used in specific curriculum courses as models for interpretation and design of lessons integrating hardware and software for a purpose.

In discussions about their future directions, some ITE providers reflected that the research in the area had moved on and a model of digital literacies was proposed. Reference was made to a model proposed by Gavin Dudeney, Nicky Hockly and Mark Pegrum in *Digital Literacies* (Dudeney, 2013). This takes SAMR further and focuses on the concept of Digital Literacy. Though the text relates to language teaching, the model proposed can apply across the curriculum and takes digital reading and digital competency away from any specific subject status to be an embedded understanding, applicable in all contexts.

These approaches take the learning of ICT beyond a skills based model to a more contemporary approach where the learning is beyond the low levels of the Bloom definitions, digital or otherwise. Beyond simple recall of a range of steps or the application of a skill out of context to students, children become creators of digital products to better engage them in learning.

There was little evidence of any level of capability or requirement specific to ICT competence to be met by ITE graduates. Other than completing a range of assignments that include ICTs and being mentored by both lecturer modelling, peer support and practicum experience, a level of attainment as recommended by international practices is not apparent.

The broader concept of digital literacy is a consideration for future ICT delivery. The expert panel were strongly in agreement that an approach of digital literacy be adopted. TPACK and a range of other models are used to assist ITE students in their planning of ICT integration, however an overarching model of capability was seen as future proofing for curriculum and technological change.

The expert panel acknowledged the very high quality ICT work being conducted within ITE programs and that ongoing collaboration between the members of the group would enhance opportunity for further improvement. Access to exemplary work would provide an ongoing resource for undergraduate and graduate study and potentially provide a professional development opportunity for teachers.

The panel, in acknowledging the work of many ITE providers in going beyond the ICT requirements for program approval, also wished to acknowledge the difficult and complex nature of staying current with technological change in the area in addition to the academic work of keeping abreast of research-based developments in the provision of ICT education through curriculum – pre-school to post-university. With this in mind it is important to support any proposed development in the expectations of programs that a research base is used to support any change and implantation.

PART 3: STANDARDS FOR DIGITAL LITERACY

What is the level of expertise we can expect from graduate teachers based on national and international standards?

ITE providers must address National Priority Areas (NPAs), which are elaborations of relevant graduate teacher standards in targeted areas, in addition to demonstrating that ITE students will meet the APST Graduate teacher stage.

The NPAs were approved by Ministers in 2013.

The NSW Supplementary Documentation: Elaborations in Priority Areas describe each National Priority Area and provide guidance to ITE providers seeking program accreditation on the skills and knowledge that ITE graduates are required to develop through the ITE program.

The NSW elaborations for the National Priority Area of ICT are found at **Appendix 3**.

ITE providers show that these accreditation requirements are met by reference to specific examples in their program. Examples may include relevant topics covered in one or more units, student learning outcomes, course readings and materials or assessments.

In discussion with members of the expert panel and with an aim to raise the digital literacy expectation of ITE students, the issues of accessibility of documents, ethical and responsible use were broadened. Discussion in the panel revolved around the level of expertise required for documents to be made accessible. Growing requirements of online materials by government agencies including the education sector raise the expectation.

The relevant standard for accessibility of documents online is the Web Content Accessibility Guidelines (WCAG) published by the Web Accessibility Initiative of the World Wide Web Consortium (W3C) (World Wide Web Consortium, 2012). As teachers increasingly prepare material for online publication, it is pertinent that all of their students are able to access the information. Materials for e-learning, Massive Online Open Courses (MOOCS), Content Management Systems (CMS) and Learning Management Systems are now commonplace in schools and require all students to have access.

In *MOOCs and the funnel of participation*, Doug Clow (Clow, 2013) analyses reasons why participation rates in MOOCS decline dramatically post initial registration and activity. Improved accessibility can only help in maintaining participant's active involvement. Improving accessibility makes access to information easier for all. Screen readers are used by vision impaired, the elderly and also by software robots in categorising and indexing web pages and other online content. Radio interviews for example are enhanced by a searchable transcript.

WCAG is an approved international standard for the accessibility of online documents (ISO/IEC 40500:2012). See **Appendix 4** for a summary of WCAG. In some cases, WCAG standards are a legal requirement.

Additionally, the expert panel felt that the understanding of the use of materials from other cultures, including from Australia's first people, was an area of sensitivity that should be communicated.

Regarding Indigenous Cultural and Intellectual Property Rights, members of the expert panel felt that this was not as evident as it should be in the NPA for ICT documentation. The issues of copyright and Intellectual Property (IP) laws are becoming increasingly relevant to Aboriginal people (Australian Society of Authors, 2010).

In *Our Culture, Our Future – Report on Australian Indigenous Cultural and Intellectual Property Rights*, a recommendation is made that "Educators should ensure that school curricula and textbooks teach understanding and respect for Indigenous peoples' heritage and history, and recognise the contribution of Indigenous people to the cultural and economic life of the Australian nation." (Terri Janke and Company, 1999).

In the appropriation and use of digital representations of Aboriginal IP in text, image or other forms, care needs to be taken to respect the rights of the owners but also importantly the sensitivity of the IP owner to the use or misuse of the IP. The issue of consent is highlighted by the IP Australia, Australian Government website (IP Australia Australian Government, 2014).

Recommendation 2

NESA will advocate to AITSL, the need to review and revise the National Priority Area for ICT to reflect the concept of digital literacy. This review will also consider a revision of the NSW Elaborations in Priority Areas – ICT to include the knowledge of Indigenous Cultural and Intellectual Property and online content accessibility guidelines, in line with international standards.

UNESCO ICT Standards for Teachers

In 2011 UNESCO redeveloped the ICT competency standards it had developed for teachers in 2008. UNESCO considers that ICTs can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development as well as improve education management, governance and administration provided the right mix of policies, technologies and capacities are in place (UNESCO, 2015).

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS

	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

UNESCO ICT Competency Framework for Teachers.
Retrieved from http://unesdoc.unesco.org/images/0021/002134/213475e.pdf on 17 November 2016.

The 2011 ICT Competency for Teachers takes a similar path to the 2008 document but lifts the expectation in both breadth and depth of technology use. The UNESCO ICT Competency Framework for Teachers (UNESCO, 2011) may provide ITE course managers with a standard to consider in terms of digital literacy for graduating students.

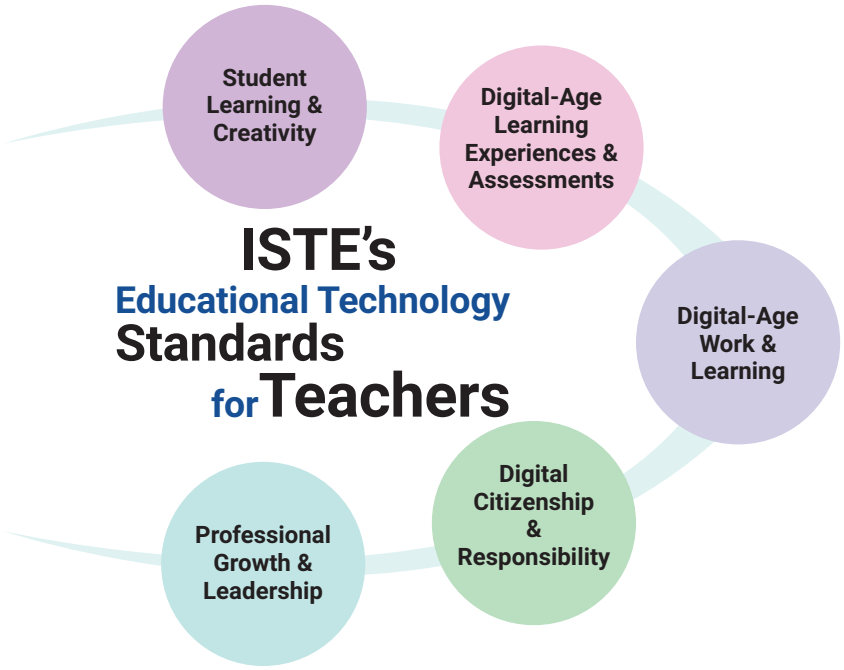
The UNESCO standards include the following tasks, which teachers should be able to do:

- Use an authoring environment or tools to design online materials.
- Demonstrate the use of an authoring environment or tools.
- Have participants work in groups to design an online unit.
- Use the network to support student collaboration within and beyond the classroom.
- Discuss the use of online communication and collaboration environments by students to support their collaborative project work and learning; have participants keep a log, share printouts, and demonstrate examples of student online interactions, in this regard.
- Design online materials and activities that engage students in collaborative problem solving, research, or artistic creation.
- Discuss characteristics of online materials that support students in the design and planning of their own learning activities; have participants work in teams to generate and evaluate online materials. Have participants model online collaborative problem solving, research, or artistic creation in a professional learning community.
- Help students incorporate multimedia production, web production, and publishing technologies into their projects in ways that support their ongoing knowledge production and communication with other audiences.

- Discuss characteristics of teacher activities that support students in the use of various production technologies in their own learning activities; have participants generate examples of such activities; have participants demonstrate examples of multimedia production, web production, and publishing technologies to support student publishing in online professional learning communities (UNESCO, 2008).

These standards were first developed in 2008 – before web 2.0, before the proliferation of digital devices, and indeed before the iPad or sophisticated "smart phones" were released.

The International Society for Technology in Education (ISTE) standards for teachers also provides a benchmark that could be used for comparison of existing programs. ISTE standards are comprehensive and take a digital literacy approach. See Appendix 2.



Accessed from https://sites.google.com/site/stillbethne/iste-nets-for-teachers

ITE providers looking to the future needs of teachers in terms of digital literacy should consider these higher levels of competence and identify potential areas for further development in their ITE programs.

Teacher Education Ministerial Advisory Group

The *Action Now: Classroom Ready Teachers*, report released in February 2015 by the Teacher Education Ministerial Advisory Group made recommendations to the federal government including:

- Implement teaching strategies for using ICT to expand curriculum learning opportunities for students.
- Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning.

- Use ICT safely, responsibly and ethically.
- Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching.

It could be argued that all standards can and should be achieved through an adoption of a digital literacy approach being embedded in curriculum delivery. The ICT Statements for Graduate Standards in the National Professional Standards for Teachers at **Appendix 1** illustrate examples of this, providing ICT statements for each individual focus area (Teaching Teachers for the Future, AITSL, 2012).

Teacher Training in ICT: a global perspective

A Global Perspective: Current Trends and Issues in ICT for 21st Century Education (Schrum 2015), brings together updates from experts around the globe. This study posed the questions:

- What do teachers need to know and be able to do today and tomorrow to support all learners? What are the best ways to prepare them?
- How are digital technologies integrated into the entire preparation program seamlessly?
- What is the status, for example, of MakerSpaces or Bring Your Own Device (BYOD) throughout the world?
- How are countries preparing for the educational environment needed in the next several decades?

The general assumption is that once hardware and software are readily available in schools, ICT integration will automatically follow. Yet one of the key determinants of the success or lack of success of any ICT initiative in education is the teacher (Khine, 2006).

Fullan and Langworthy (2014) suggest these "new pedagogies… require students not only to create new knowledge, but also to connect it to the world, using the power of digital tools to do things that we value in our knowledge-based, technology-driven societies" (p. 1). New conceptions of formal and informal learning, especially in the maker movement (Martin, Bowden, & Merrill, 2014; Martinez & Stager, 2013; Peppler & Bender, 2013), require continuous professional development and revisions of teacher candidate preparation (Schrum, 2015).

The creation of digital products, in addition to the 'traditional' uses of ICTs (word processing, email, spreadsheets, presentation software), is a new imperative that takes ICT and aligns it with contemporary pedagogies in Technology Education around Project Based Learning, the integration of knowledge and the increased engagement of students to create deep understanding.

Canadian provincial ICT plans and policies tend to refer to improving student learning with specific mention of developing information literacy and ICT-based skills in critical thinking, collaboration, and communication (Schrum, 2015).

The Netherlands investigated the concept of 21st century skills and some clarification and definition of that concept; it was adopted in a study about the presence of 21st century skills in the primary and secondary school curriculum and it was concluded that the core objectives for primary and secondary education do not explicitly address digital literacy (Thijs, 2015).

Professional digital competence in the teaching profession

In Norway a standard has been set for digital literacy for teaching professionals. In 2006, Norway became the first European country to develop a national curriculum that established what is today referred to as "digital skills" as a fundamental competence on par with oral skills, reading, writing, and doing arithmetic.

From 2012, the Norwegian Directorate for Education and Training has increasingly opened up learners' access to the internet during national exams.

Norway's recent decision that the main model for Norwegian teacher education should be a research and development based, five-year master's program has transformed the context for what is now referred to as teachers' Professional Digital Competence (PDC).

PDC is a framework that has developed over time and is currently making an impact on Norwegian teacher education.

> How is PDC in teacher education different from similar competences in other professional fields of study, such as psychology, pharmacy, law, or engineering? One obvious difference is that, in teacher education, the aim is not solely to educate student teachers as to how to understand and use various emerging technologies that are relevant to the execution of a particular craft or profession. In addition it involves being able to make their learners capable of using technology and learning resources in productive ways (Lund, 2014).

This represents a dual challenge.

Technologies are powerful mediating and transformative artefacts. Learning is woven into the use of artefacts, to the extent where we cannot only assess results or documentation of learning but must also include how we arrive at knowledge through relevant, informed selection and use of available cultural tools or artefacts – or what Säljö refers to as the "performative" nature of learning. (Säljö, 2010) If we do not do this, both learning activities and the assessment of them lose their ecological validity; they do not correspond with how we in practice and in everyday situations organise ourselves to learn, solve problems, and develop new insights (Lund, 2014).

PDC entails that student teachers can make informed judgments about ICT enhanced practices based on generic as well as subject-specific qualities that are embedded in the artefacts. PDC provides a framework for the full integration of digital literacies into the daily life of graduate teachers.

In addition, it involves being able to make their learners capable of using technology and learning resources in productive ways. This represents a major challenge, as it goes beyond the immediate needs of student teachers and involves situations where their knowledge is transformed into discipline-specific didactics, classroom management, and assessment of how pupils make productive use of available cultural resources. As Sandberg and Pinnington (2009, in Lund) show, professional competence and "distinct use of tools" should be understood as ways of being – that is, at the very heart of professionalism (Lund, 2014).

DigiComp is a standard for the digital competency of teachers in Europe. It was a project that culminated with an e-learning portal, available to everyone, which provides a model of digital literacy with samples. It claims to have grown "from a project to a digitally competent teacher". The methodology was to train teachers to confidently and critically use ICT in teaching, cooperate and communicate with the assistance of ICT and use tools for creating digital content. This project defined digital competencies in five areas: information, problem solving, safety, content creation and communication (European Union, 2015).

Research shows that not all young people are tech-savvy or have an interest in learning more about ICTs. Exposure to technology cannot be equated with ability to use it. For example, an Australian study found that only 15 per cent of the student population are advanced users of ICTs while 45 per cent of all students could be described as rudimentary digital technology users. Similarly, a survey carried out in Austria indicates that only 7 per cent of 15–29 year olds have very good computer skills. This reflects the anecdotal experiences of ITE providers and ICT leaders. Students come with a range of skills from rudimentary or computer phobic to ex-computer industry professionals.

A survey of Italian university students revealed that most of them have very low level knowledge of digital security. For example, 42 per cent of the students are not adequately aware of the risks of a free Wi-Fi, 40 per cent of them do not protect access to their phones and 50 per cent of students never or rarely set control permissions when prompted by an application. Numerous studies carried out in Canada have also repeatedly rejected the notion that there exists a significant difference with respect to the ICT competence of 'digital natives' and 'digital immigrants' (Prensky, 2001). Dr. Dan Russell, a senior Google researcher, believes that based on the 'digital natives' assumption, many colleges in the US make a dangerous mistake when cancelling digital education courses (ECDL Foundation, 2014).

Young people are not aware of their digital skills gaps – young users of digital technologies usually tend to overestimate their ICT skills. A 2014 study indicates a wide discrepancy between young people's self-assessment and actual knowledge of computer skills. For example, 84 per cent of respondents claimed that they had 'very good' or 'good' knowledge of the internet; however, in practical tests 49 per cent of them scored 'bad' or 'very bad'. The biggest gap between perceived skills and actual skills is persistently found among young people (15–29 years old) (ECDL Foundation, 2014).

Teaching Teachers for the Future

In 2011–12 the TTF, an ICT Innovation Fund Project, was completed by AITSL, Education Services Australia (ESA) in cooperation with the Australian Council for Computers in Education and the ACDE.

This developed a conceptual framework underpinning three components:

- build explicit Information and Communication Technologies in Education (ICTE) dimensions to complement the National Professional Standards for Graduate Teachers
- develop high quality ICTE teacher education digital resources
- establish a national network of ICTE expertise to build capacity in graduates and improve teacher education programs, by seconding highly accomplished ICTE educators to work in universities.

The goal of this project was to build the ICTE capacity of pre-service teachers in Australian universities.

A website for National Standards (**www.ttf.edu.au**) was built and elaborations and annotations of exemplars to assist beginning teachers and resources were also developed and mapped to four areas of the Australian Curriculum. Illustrations of practice have been available to assist teachers. This project also advocated the use of the TPACK framework. TPACK identifies the knowledge teachers need to teach effectively with technology. The TPACK framework extends Shulman's idea of Pedagogical Content Knowledge (Koehler, 2006).

The TTF project also developed a series of recommendations. The first and third recommendations from this document relate directly to ITE.

It was recommended that each faculty or school responsible for teacher education should develop and maintain a repository of resources accessible to students and staff so the work can be built upon over years. They were also asked to develop a leadership team to help use these resources in a manner fitting the TPACK model. It was these leadership teams who were consulted and provided input to this report via interview, program submission or as part of the expert panel.

The recommendations from this report also encouraged the development of integrated strategies and a model of redesign to impact faculty wide that would lead to sustainable improvements – the goal being that graduates can demonstrate the ICT dimensions of the National Standards for Graduate Teachers (see **Appendix 1**). It would be prudent to provide ITE students with an accurate measure of their own abilities compared to a standard.

Recommendation 3

NESA will advise NSW ITE providers on including knowledge and understanding of the AITSL ICT Statements in their ITE programs. This may be through course accreditation documentation or as a self-assessment tool to enhance teacher education students' understanding of their own capabilities.

PART 4: FURTHER DEVELOPMENT IN THE DELIVERY OF ICT IN ITE

It is important to acknowledge the work (**outlined in Part 2 of this report**) that is being done by ITE providers to ensure that beginning teachers have a grounding in the place and importance of ICT in teaching and learning. However, recent cited reports have signalled areas for consideration and improvement. Reports published since the release of GTIL provide some direction for considering where areas of current strengths and weaknesses or gaps in the ICT content and pedagogies in current ITE programs may lie.

Teacher and system readiness

From existing data, we can see a high level of satisfaction in the preparation of graduates by ITE providers in the area of ICTs. Responses by school principals to the Staff in Australia's Schools 2013 survey showed that both primary and secondary graduates were seen as 'well prepared' or 'very well prepared' in 'making effective use of ICT' (Australian Council for Educational Research, 2014).

When surveyed about how graduate teachers are prepared in terms of "…knowing the content and how to teach it: Making effective use of ICT", 70.4 per cent of primary principals and 76.1 per cent of secondary principals indicated "very well prepared" or "well prepared" (Australian Council for Educational Research, 2014).

Similar evidence is found in the Longitudinal Teacher Education and Workforce Study conducted by Deakin University, which followed a cohort of new teachers – most of whom completed their ITE in 2011. The study reported that graduates are seen as "energetic and passionate, open to new ideas and willing to learn". It also makes the point that graduates bring fresh ideas, particularly in ICT and e-learning, and that ICT was often named as a strength and a success identified by principals and school leaders. They also identified that these new graduates were supporting other staff with the application of ICT in class and provided mentorship to older staff (Deakin University, 2015).

Over 90 per cent of respondents either 'agreed' or 'strongly agreed' that graduates were effective in their use of ICTs (Deakin University, 2011).

This picture may not be complete, however, considering the perceived needs of graduates in terms of professional development requirements. The final report – *Studying the Effectiveness of Teacher Education, 2015* – states that early career teachers rate ICT hands on learning as being a very high need.

The (survey) analysis found that responses to strengthening programs clustered around calls for more "hands on direct learning of ICT" amongst other priorities. Graduates, though assessed as being well prepared, saw in themselves a need for further development.

ICT was the area in which the highest proportion of those who had been teaching for more than five years expressed a need for more opportunities for professional learning (Deakin University, 2011).

Overall, graduate teachers and their first supervising principal are happy with the preparation to teach and embed ICT in their teaching, but it then becomes clear that the teachers themselves see a need for greater professional development and hands on learning in the area. This is likely to be a reaction to the

ubiquitous nature of digital technology, the digitalisation of the workplace, and the plethora of devices students have access to in the home and now at school with the growing popularity of BYOD policies.

In 2008 the federal government implemented the Digital Education Revolution (DER) and as part of that implementation some time was spent considering the future of ICT education in Australia.

Part of the DER strategic plan included, "ICT in Education, Where are we now, Where do we want to be?" which listed aspirational goals. It is worth considering if we have reached those goals yet.

Aspirational goals

- All students have personal access to an appropriate information access and/or computing device in all areas of learning.
- Teachers devise student-centric programs of learning that address agreed curriculum standards and employ contemporary learning resources and activities.
- Students engaged in rigorous and stimulating programs of learning that meet their individual needs and prepare them for success in 21st century.
- Courses and resources are available anywhere, anytime.
- Parents are able to view student programs and progress at any time online and communicate with teachers and school leaders.
- Students and teachers routinely collaborate, build and share knowledge using digital technologies – blogs, file sharing, social networking, video conferencing etc.
- Students and teachers are able to innovate in their use of ICT to achieve learning outcomes.
- School leaders routinely plan at the school and system level for ongoing improvement enabled by ICTs.

(Australian Government, 2008)

There is no empirical evidence available to assess these aspirational goals. There is data from the OECD that shows Australia is the 'richest' country when hardware to student ratios are compared, resulting from the Digital Education Revolution and the recent trend for schools to implement a BYOD policy.

Measures of success of the other goals are not yet available. The expert panel were strong in their support that any shift in direction for the provision of ICT education in ITE be supported by contemporary research.

Recommendation 4

ITE providers should ensure that the provision and approach to the teaching of digital literacy, ICT skills and capabilities of teacher education students is supported in all relevant ITE units by contemporary research.

Sharing exemplary practice

Initial Teacher Education (ITE) providers acknowledged that the recommendations of the Teaching Teachers for the Future (TTF) project had significant impact. The exemplar units provided for English, Mathematics, Science and History components of the Australian Curriculum (AC) are available to ITE students and to all teachers. NSW is progressively adopting the AC in all subjects by integrating AC content into syllabus documents which expand, enhance and provide the depth of direction that NSW teachers have grown accustomed to. Teachers change practice by observing the successful work of others. The development of better ICT-supported pedagogy through collegial practice transfer is well researched and supported as an effective approach to developing teacher pedagogy.

In the synthesis review of research, *Teaching and Leading for Quality Australian Schools* for Australian Institute for Teaching and School Leadership (AITSL), the authors identified that a database for the teaching profession should include amongst other things exemplars of best practice. The paper goes on to recommend that the education community should be encouraged to contribute exemplars (University of Western Sydney, 2007). As digital technologies and skills in using them become essential to all citizens, there has been a similar growth in the availability of resources to support the teaching and understanding. Teachers and ITE students are frequently searching online for resources, software and approaches that will enhance the learning of their students. The plethora of websites makes finding work appropriate to the NSW curriculum time consuming. The expert panel felt that exemplar materials that can be used by teacher education students during their professional experience placements to integrate digital literacy best practice would be beneficial. A sustainable model for the retention of these materials as an ongoing resource will need to be developed.

Recommendation 5

NESA, in conjunction with employing authorities and ITE providers, will identify exemplar materials that can be used by teacher education students during their professional experience placements focusing on digital literacy best practice.

PART 5: CURRICULUM AND DIGITAL DISRUPTION

The ICT capability is a cross curriculum learning priority within NSW syllabus documents. ICT is placed in a broad context of learning. This is above and in addition to the specific, explicit references in each syllabus regarding the use of ICTs.

ICT as cross curriculum learning has existed in NSW schools since the late 1990s with a constant focus on utilising ICT as a tool to assist the learner.

ITE focuses on the specific subject requirements as indicated within NESA syllabus documents and also provides opportunity for further general study regarding technology use in education. As curriculum is revised the requirement for the use and integration of ICT grows with that of society. As technology develops, curriculum aims to maintain its relevance by strategically placing ICT in broad descriptions and with the use of generic terms so the syllabus does not become too technology specific. A floppy disk is not relevant in today's digital landscape, for example.

Recent curriculum review of the Science and Technology K–6 and Technology (mandatory) years 7 to 10 subjects to integrate Australian Curriculum content will increase the rigour of digital technologies within those specific subjects in the NSW suite of syllabuses. This development will increase coding in schools (computer programming), computational and algorithmic thinking – identified by many as a new literacy. Likely to impact across the curriculum in future years, teachers of all subjects will benefit from an understanding of the analytical thinking resulting from a mandatory study of coding by all students. The ability to create analyses within, for example, social sciences, mathematics and the arts will better prepare students for their futures.

The New Media Consortium Horizon Report: 2016 K–12 edition identifies coding as a literacy (Adams Becker, 2016).

In 2015 the NMC Horizon report (Johnson, 2015) identified some new technologies to become common place. 3D printing, design thinking approaches and 'maker spaces' will provide opportunities for K–12 education. NSW is well placed in this regard with leading technology education curricula, with the first 3D printer being placed in a school in 2006. An initiative coordinated by the Institute of Industrial Arts Technology Education with a grant from the Australian School Innovation in Science Technology and Mathematics program was a federally funded program to upskill teachers using a collaborative model. Over 3000 teachers were trained nationally in Computer Aided Design. Many utilised the 3D printing technology housed at Bossley Park High School as a bureau (Institute of Industrial Arts Technology Education, 2006).

NESA has also initiated substantial resource development around coding across the curriculum, Science, Technology, Engineering and Mathematics (STEM) education and opportunities for integrated learning, through for example the Program Builder (www.pb.bos.nsw.edu.au). These trends were reflected by predictions in the 2015 NMC Horizon report for the next five years globally.

There is no doubt that the use of ICTs is an essential skill for future teachers. Its use in all aspects of schooling from delivery of curriculum, through to assessment and administration has grown dramatically in recent years.

Future projections are that this impact will become more dramatic in the coming decade. The impact of developing educational technology at all levels is clearly identified in the 2015 and 2016 NMC Horizon reports. These are not limited to the digitalisation of education, including assessment and feedback, the progression to integrated learning, STEM and STEAM (STEM plus Arts), flipped classrooms, redesigned learning spaces, alternative assessment models moving away from examinations and the increased use of project based and challenge based education. Finland are reported in *The Independent*, for example as replacing some subject specific lessons with "topics" of bigger picture challenges which lead to deeper and more relevant learning (Garner, 2015).

Recent reports such as *A Smart Move* (Pricewaterhouse Coopers, 2015), *Australia's Digital Pulse* (Deloitte Access Economics, 2015) and the Australian Council for Economic Development (ACED) report *Australia's Future Workforce* (Council for Economic Development Australia, 2016) emphasise the digital disruption coming to all workplaces and all careers, with many being predicted to be affected profoundly.

The digitalisation of the workplace, society and communications cannot be argued.

During 2015 the Australian Computer Society commissioned Deloitte Access Economics to investigate the digital economy and ICT education in schools. This work was updated in 2016 focussing on employable skills. *Australia's Digital Pulse, Key challenges for our nation – digital skills, jobs and education*, represents a summary of the impact of the digitisation of the workplace, society and the needs for future generation's learning.

Predictions by both PricewaterhouseCoopers, and Deloitte Access Economics for the Australian Computer Society indicate that many of the jobs people work in today "simply won't exist in the next decade". They make the point that all careers, and consequently all school graduates, will require digital skills. It is implicit in the context of ICT in ITE that our graduate teacher workforce will also require these skills.

Our graduating teachers will not only need to be digitally literate but they are also required to be capable of helping their future students produce digital solutions.

> *The rapidly growing digital economy means that ICT skills will play an increasingly important role in future economic growth. Australia needs to ensure that its education system, policy settings and business practices are all working towards equipping our workers with the required technological skills. This will ensure that the Australian workforce is well-placed to meet the future challenges associated with digital disruption.*
> (Deloitte Access Economics, 2015) Page 7

The increasing focus on STEM careers often includes reference to digital technologies education as building future capabilities. Though STEM education is the focus of both mandatory and elective subjects in NSW school curriculum, the integrated approach that it often brings will provide opportunity for the improvement of digital literacy. The work of Deloitte Access Economics for the Australian Computer Society would imply that all subjects in the curriculum will need to integrate digital skills.

They support the increased implementation of specific digital technologies curricula and the increased integration of ICT into all subjects. STEM education is, in addition to the recognition of the importance of its constituent subjects, a model of integrated learning that may be seen as a forerunner to further integration. Virginia Tech (Sanders, 2015) promotes an integrative STEM education and Yakman (2006) has been an advocate of STEAM education where the Arts and Social Sciences are integrated into projects – STEAM = Science & Technology interpreted through Engineering & the Arts, all based in Mathematical elements (Yakman, 2006).

The NMC Horizon report of 2015 identifies STEAM education as a trend to increase over the short term future (Johnson, 2015). The report identified STEAM as one of six key trends. In 2015 these were, rethinking how schools work, shift to deeper learning approaches, increased use of collaborative learning, shift from students as consumers to students as creators, the increased use of blended learning as well as the rise of STEAM learning, all as a result of accelerating technology adoption K–12. (Johnson, 2015) In preparing teachers for this future shift in educational delivery, initial teacher education has some challenges to meet. The shift from identifying a strict set of digital competencies seems increasingly irrelevant. Teachers will need digital skills and competence but in a broad sense so they can move to become designers of learning opportunities – utilising the tools and equipment, the resources available in their situation at that time. They also need to be able to recognise when digital tools are not the most appropriate option.

In the Higher Education Edition of the Horizon Report (Johnson, 2016) the impact of the same technologies affecting K–12 education are drawn out to apply to the University sector. Blended learning, deeper learning, changing assessment practices, improving digital literacy, augmented reality and virtual reality, and automation impacts are discussed. ITE is not excluded from these changes, and given that the teachers they are graduating will be empowering the next generation of learners, their digital literacy, STEM problem solving skills and creativity and flexibility will be essential.

A relatively highly educated workforce has been a traditional source of advantage for Australia. However, the rapid rise in global education means this historic strength is being eroded. Further, the increasing ability of computers to substitute human thinking means Australia needs to ensure that the education system is providing students with valuable skills for their future employability.

Digital competency to be a basic competency for all workers in the future as Australia does not need larger numbers of computer programmers. Outside a few core areas, Australia lacks the size to become an ICT powerhouse. However, Australia will require ICT students with capabilities in architecting, designing and analysing to adopt international ICT developments if its industries are to stay globally relevant.
(Council for Economic Development Australia, 2016)

This was also recognised in the Melbourne Declaration on Educational Goals for Young Australians:

> Rapid and continuing advances in information and communication technologies (ICT) are changing the ways people share, use, develop and process information and technology. In this digital age, young people need to be highly skilled in the use of ICT. While schools already employ these technologies in learning, there is a need to increase their effectiveness significantly over the next decade (Ministerial Council on Education, 2008).

Developments in ICT have accelerated over this time especially in the areas of social media, computing power, interconnectivity, web technologies, e-commerce, data sharing and increased access and mobility.

Taking into account the work of Deloitte, PricewaterhouseCoopers, ACED, the World Economic Forum and others the expert panel resolved that teaching ITE students and consequently students in schools "how to press buttons" was insufficient for a rapidly changing future. Although technical skills and competence are a necessary part of using ICT effectively and fundamental understanding is essential, a deeper approach to ICT knowledge and skills was required.

ICT education in ITE needs to meet curriculum requirements but also engender confidence to seek ICT and digital literacy opportunities in teaching.

If we are to meet the overarching concept to "develop the knowledge, skills, understanding, attitudes and behaviours to assist students to live and work successfully in the 21st century," (Board of Studies Teaching and Educational Standards, 2011), then an approach to ICT beyond specific syllabus statements needs to be taken.

There are opportunities to use and exercise digital literacies in every syllabus and in almost every situation. However, a balanced view needs to remain.

In 2014, reflecting on the Program for International Student Assessment (PISA) 2012 Francesco Avvisati, OECD Director for Education and Skills made some observations that simply providing more ICT and more hardware to students did not in itself improve results. In fact, the data could be interpreted that free access to the internet, Facebook, mobile phones, and ICT in general could be detrimental to results.

Being critical in their use of ICT in educating their students is a skill that all future teachers will need.

ITE providers may consider that the specific reference to ICT learning as something special or different to normal procedures is a thing of the past. The ubiquitous nature of digital technology makes it relevant in all situations. Knowing when to use ICT to improve learning and to learn digital competence and capability may be a refocus of teacher preparation.

The term Information and Communication Technology has been with NSW education for over 20 years; a transition to the concept of digitally literate teachers and students will require some strategic planning, including common use and understanding of the term in NESA documents and presentations.

Additional effort will be required with those school leaders and supervisors of professional experience placements. This in turn will require some re-thinking over time of the presentation and delivery of ICT units as both stand alone and integrated within ITE programs.

In informal conversations as part of the research for this report, providers revealed that they were already progressing towards this position in their own future planning. Shin identified in 2015 that pre-service teachers may not give as serious consideration to copyright and e-safety issues as they should. (Shin, 2015) With social media and digital footprints for everyone involved in utilising online technologies, it is imperative that supervisors are also a focus of professional development, so that teacher education students can be appropriately supported and assessed.

Recommendation 6

NESA, in conjunction with employing authorities and ITE providers, will lead the identification of targeted professional development that aims to improve the digital literacy skills for supervisors supporting and assessing teacher education students on professional experience placements and mentors of beginning teachers.

PART 6: SUPPORTING IMPROVEMENT IN ICT DELIVERY TO ITE STUDENTS

In acknowledging the excellent work currently conducted by ITE providers, but also considering the rapid rate of technological development leading to societal change with the digitalisation of the workplace, some support is required for the continued improvement necessary to produce a teacher able to engage 21st century students. The review team also acknowledges the demands placed on those in universities who deliver and administer the growing digital domain. Remaining current with hardware, software, applications, the range of devices and school implementation models will continue to be a difficult task. The transition over time to a digital literacy model is likely to reduce this load. Teaching a specific skill set as the only set is rapidly out-dated. Learning a skill to achieve a task in different ways will become the norm.

The implementation of components of the TTF project has resulted in a range of exemplary teaching units to assist teachers in training and in their early years to integrate ICT into teaching four subjects of the Australian Curriculum. These remain relevant in NSW as the AC outcomes are embedded in NSW syllabus documents. However, the expert panel also identified that students often completed a final year project that typically utilised ICT pedagogies in the approach to the unit. In addition to recommendation 5 where exemplary work was identified from any source, it was felt that student work across programs could be amalgamated and made available for the benefit of others. The additional benefit is to provide a model of Project Based Learning where the 'public audience' is one of the drivers of success of that model (Lucas Foundation, 2009).

ITE providers report that they have seen some outstanding work completed during the latter years of courses. The review committee and members of the expert panel identified opportunities for this work to be shared across programs in addition to the AC work in four subjects. In the pursuit of a concept of digital literacy, providers are able to share exemplars which will assist students in their Professional Experience Placements and in peer coaching of colleagues and mentoring others (Lakkala, 2015).

Graduates are identified as having strengths in this area. The collegial practice of mentoring by example is well reported as a successful method of improving teacher skills and knowledge. Teacher collaboration and the sharing of expertise is an effective method of improving practice.

Recommendation 7

NESA undertakes, in partnership with the NSW Council of Deans of Education, a project to share exemplary work by final year teacher education students on the integration of ICT within capstone teaching performance assessments.

RECOMMENDATIONS

1. NESA, in consultation with ITE providers and employing authorities, will review current ITE requirements in ICT to identify how the broader concept of digital literacy can be incorporated. The work will consider what digitally literate graduate teachers should know and be able to do.

2. NESA will advocate to AITSL, the need to review and revise the National Priority Area for ICT to reflect the concept of digital literacy. This review will also consider a revision of the NSW Elaborations in Priority Areas – ICT to include the knowledge of Indigenous Cultural and Intellectual Property and online content accessibility guidelines in line with international standards.

3. NESA will advise NSW ITE providers on including knowledge and understanding of the AITSL ICT Statements in their ITE programs. This may be through course accreditation documentation or as a self-assessment tool to enhance teacher education students' understanding of their own capabilities.

4. ITE providers should ensure that the provision and approach to the teaching of digital literacy, ICT skills and capabilities of teacher education students is supported in all relevant ITE units by contemporary research.

5. NESA, in conjunction with employing authorities and ITE providers, will identify exemplar materials that can be used by teacher education students during their professional experience placements focusing on digital literacy best practice.

6. NESA, in conjunction with employing authorities and ITE providers, will lead the identification of targeted professional development that aims to improve the digital literacy skills for supervisors supporting and assessing teacher education students on professional experience placements and mentors of beginning teachers.

7. NESA will undertake, in partnership with the NSW Council of Deans of Education, a project to share exemplary work by final year teacher education students on the integration of ICT within capstone teaching performance assessments.

APPENDIX 1: NATIONAL PROFESSIONAL STANDARDS FOR TEACHERS

aitsl Australian Institute for Teaching and School Leadership Limited

ICT Statements for Graduate Standards

STANDARD 1	**Know students and how they learn**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
1.1 Physical, social and intellectual development and characteristics of students	Demonstrate knowledge and understanding of physical, social and intellectual development and characteristics of students and how these may affect learning.	Demonstrate knowledge and understanding of ways that students' ICT use can influence their physical, social and intellectual development and how this may affect the students' engagement and learning.
1.2 Understand how students learn	Demonstrate knowledge and understanding of research into how students learn and the implications for teaching.	Demonstrate knowledge and understanding of research into how student engagement and learning can be enhanced through the use of digital resources and tools.
1.3 Students with diverse linguistic, cultural, religious and socioeconomic backgrounds	Demonstrate knowledge of teaching strategies that are responsive to the learning strengths and needs of students from diverse linguistic, cultural, religious and socioeconomic backgrounds.	Demonstrate the ability to match digital resources and tools with teaching strategies in ways that are responsive to students' diverse backgrounds.
1.4 Strategies for teaching Aboriginal and Torres Strait Islander students	Demonstrate broad knowledge and understanding of the impact of culture, cultural identity and linguistic background on the education of students from Aboriginal and Torres Strait Islander backgrounds.	
1.5 Differentiate teaching to meet the specific learning needs of students across the full range of abilities	Demonstrate knowledge and understanding of strategies for differentiating teaching to meet the specific learning needs of students across the full range of abilities.	Select and use specific digital resources and tools that are matched to teaching strategies designed to meet students' individual and diverse learning needs.
1.6 Strategies to support full participation of students with disability	Demonstrate broad knowledge and understanding of legislative requirements and teaching strategies that support participation and learning of students with disability.	Demonstrate knowledge and understanding of digital resources and tools, including adaptive and assistive technologies, that can support the participation and learning of students with disability.

STANDARD 2	**Know the content and how to teach it**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
2.1 Content and teaching strategies of the teaching area	Demonstrate knowledge and understanding of the concepts, substance and structure of the content and teaching strategies of the teaching area.	Demonstrate knowledge and understanding of ways that the use of digital resources and tools can complement teaching strategies of specific teaching areas.
2.2 Content selection and organisation	Organise content into an effective learning and teaching sequence.	Demonstrate the ability to select and organise appropriate digital content in relation to relevant curriculum.
2.3 Curriculum, assessment and reporting	Use curriculum, assessment and reporting knowledge to design learning sequences and lesson plans.	Demonstrate the ability to use digital resources and tools when devising learning sequences and lesson plans designed to meet curriculum, assessment and reporting requirements.
2.4 Understand and respect Aboriginal and Torres Strait Islander people to promote reconciliation between Indigenous and non-Indigenous Australians	Demonstrate broad knowledge of, understanding of and respect for Aboriginal and Torres Strait Islander histories, cultures and languages.	Demonstrate broad knowledge and understanding of how digital resources and tools can be used to promote understanding and respect for Aboriginal and Torres Strait Islander histories, cultures and societies.
2.5 Literacy and numeracy strategies	Know and understand literacy and numeracy teaching strategies and their application in teaching areas.	Know and understand how teaching and learning with technologies can enable, support and enhance literacy and numeracy development.
2.6 Information and Communication Technology (ICT)	Implement teaching strategies for using ICT to expand curriculum learning opportunities for students.	Demonstrate the ability to use a range of digital resources and tools in ways that enable deep engagement with curriculum and support a range of approaches to learning.

STANDARD 3	**Plan for and implement effective teaching and learning**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
3.1 Establish challenging learning goals	Set learning goals that provide achievable challenges for students of varying abilities and characteristics.	Demonstrate how to set goals that include the use of digital resources and tools to support differentiated approaches to teaching and learning.
3.2 Plan, structure and sequence learning programs	Plan lesson sequences using knowledge of student learning, content and effective teaching strategies.	Select and sequence digital resources and tools in ways that demonstrate knowledge and understanding of how these can support learning of the content of specific teaching areas and effective teaching strategies.
3.3 Use teaching strategies	Include a range of teaching strategies.	Demonstrate knowledge and understanding of how to support a range of teaching strategies through the use of digital resources and tools. These ways may include the promotion of creative and innovative thinking and inventiveness, engagement of students by exploring real world issues and solving authentic problems, the promotion of student reflection and promotion of collaborative knowledge construction.
3.4 Select and use resources	Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning.	Demonstrate knowledge of the use of digital resources and tools to support students in locating, analysing, evaluating and processing information when engaged in learning.
3.5 Use effective classroom communication	Demonstrate a range of verbal and non-verbal communication strategies to support student engagement.	Use a range of digital resources and tools to support effective communication of relevant information and ideas, taking into account individual students' learning needs and backgrounds, the learning context, and teaching area content.
3.6 Evaluate and improve teaching programs	Demonstrate broad knowledge of strategies that can be used to evaluate teaching programs to improve student learning.	Demonstrate the capacity to assess the impact of digital resources and tools on students' engagement and learning when adapting and modifying teaching programs.
3.7 Engage parents/carers in the educative process	Describe a broad range of strategies for involving parents/carers in the educative process.	Describe how digital resources and tools can support innovative ways of communicating and collaborating with parents/carers to engage them in their children's learning.

STANDARD 4	**Create and maintain supportive and safe learning environments**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
4.1 Support student participation	Identify strategies to support inclusive student participation and engagement in classroom activities.	Identify strategies that address the diverse needs of learners through learner-centred approaches that are supported by selection and sequencing of available digital resources and tools.
4.2 Manage classroom activities	Demonstrate the capacity to organise classroom activities and provide clear directions.	Demonstrate the capacity to provide clear directions and manage student access to digital resources and tools to support student engagement and learning.
4.3 Manage challenging behaviour	Demonstrate knowledge of practical approaches to manage challenging behaviour.	Demonstrate knowledge of practical approaches for encouraging responsible social interactions and make use of digital resources and tools, as appropriate to the needs, backgrounds and interests of students, when managing challenging behaviours.
4.4 Maintain student safety	Describe strategies that support students' wellbeing and safety working within school and/or system, curriculum and legislative requirements.	Demonstrate understanding of risks to students' well-being and safety while using digital resources and tools. Demonstrate understanding of practices and tools to mitigate these risks.
4.5 Use ICT safely, responsibly and ethically	Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching.	Demonstrate understanding of safe, legal and ethical use of digital resources and tools, including cyber safety practices, respect for copyright, intellectual property, and the appropriate documentation of sources.

STANDARD 5	**Assess, provide feedback and report on student learning**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
5.1 Assess student learning	Demonstrate understanding of assessment strategies, including informal and formal, diagnostic, formative and summative approaches to assess student learning.	Demonstrate understanding of the educative value of providing students with multiple and varied diagnostic, formative and summative assessments and the application of digital resources and tools in facilitating a range of approaches to assessment.
5.2 Provide feedback to students on their learning	Demonstrate an understanding of the purpose of providing timely and appropriate feedback to students about their learning.	
5.3 Make consistent and comparable judgements	Demonstrate understanding of assessment moderation and its application to support consistent and comparable judgements of student learning.	Demonstrate knowledge and understanding of the ways that digital resources and tools can be used to enhance the validity, reliability and efficiency of approaches to assessment and evaluation.
5.4 Interpret student data	Demonstrate the capacity to interpret student assessment data to evaluate student learning and modify teaching practice.	Demonstrate the capacity to use digital tools for recording, managing and analysing student assessment data to inform future practice.
5.5 Report on student achievement	Demonstrate understanding of a range of strategies for reporting to students and parents/carers and the purpose of keeping accurate and reliable records of student achievement.	Demonstrate knowledge and understanding of current and potential use of digital resources and tools to support reporting to students and parents/carers and for achievement record keeping.

STANDARD 6	**Engage in professional learning**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
6.1 Identify and plan professional learning needs	Demonstrate an understanding of the role of the National Professional Standards for Teachers in identifying professional learning needs.	Demonstrate an ability to use the ICT Statements of the National Professional Standards for Teachers to identify personal goals for professional development.
6.2 Engage in professional learning and improve practice	Understand the relevant and appropriate sources of professional learning for teachers.	Understand how to improve professional practice in the effective use of digital resources and tools through means including evaluation and reflection on current research and professional practice on a regular basis, and collaboration with colleagues both nationally and internationally through participation in online learning communities.
6.3 Engage with colleagues and improve practice	Seek and apply constructive feedback from supervisors and teachers to improve teaching practices.	
6.4 Apply professional learning and improve student learning	Demonstrate an understanding of the rationale for continued professional learning and the implications for improved student learning.	

STANDARD 7	**Engage professionally with colleagues, parents/carers and the community**	
FOCUS AREA	**DESCRIPTOR**	**ICT STATEMENT**
7.1 Meet professional ethics and responsibilities	Understand and apply the key principles described in codes of ethics and conduct for the teaching profession.	Understand and apply ethical and professional practice principles when using digital resources and tools for teaching and learning.
7.2 Comply with legislative, administrative and organisational requirements	Understand the relevant legislative, administrative and organisational policies and processes required for teachers according to school stage.	
7.3 Engage with the parents/ carers	Understand strategies for working effectively, sensitively and confidentially with parents/carers.	Understand how to use digital resources and tools for communicating effectively, ethically, sensitively and confidentially with parents/carers.
7.4 Engage with professional teaching networks and broader communities	Understand the role of external professionals and community representatives in broadening teachers' professional knowledge and practice.	Understand the range of opportunities for sharing and enhancing professional practice available through online communication with experts and community representatives, and contribution to professional and community sites, online discussions and forums.

APPENDIX 2: INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION STANDARDS

Effective teachers model and apply the ISTE Standards for Students as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community.

All teachers should meet the following standards and performance indicators.

1. Facilitate and inspire student learning and creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

- **a.** Promote, support, and model creative and innovative thinking and inventiveness
- **b.** Engage students in exploring real-world issues and solving authentic problems using digital tools and resources
- **c.** Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
- **d.** Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

2. Design and develop digital age learning experiences and assessments

Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the Student Standards.

- **a.** Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
- **b.** Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
- **c.** Customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
- **d.** Provide students with multiple and varied formative and summative assessments aligned with content and technology standards, and use resulting data to inform learning and teaching

3. Model digital age work and learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.

- **a.** Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
- **b.** Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation
- **c.** Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital age media and formats
- **d.** Model and facilitate effective use of current and emerging digital tools to locate, analyse, evaluate, and use information resources to support research and learning

4. Promote and model digital citizenship and responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behaviour in their professional practices.

- **a.** Advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources
- **b.** Address the diverse needs of all learners by using learner-centred strategies providing equitable access to appropriate digital tools and resources
- **c.** Promote and model digital etiquette and responsible social interactions related to the use of technology and information
- **d.** Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital age communication and collaboration tools

5. Engage in professional growth and leadership

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.

- **a.** Participate in local and global learning communities to explore creative applications of technology to improve student learning
- **b.** Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others
- **c.** Evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
- **d.** Contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community

APPENDIX 3: ELABORATION OF NATIONAL PRIORITY AREA ICT

Initial Teacher Education Program Outcomes

Initial teacher education programs should ensure that graduate teachers have demonstrated skills and/or knowledge, as noted below.

Knowledge

- Understanding of the underlying social and pedagogical implications of ICT and their application to education
- Knowledge of responsible and ethical use of digital information including in relation to plagiarism, copyright, censorship, bullying and privacy

Teaching strategies

- Understanding of innovative use of information and communication technologies in enhancing student learning
- Understanding of the capacity of ICT to support differentiated student-centred learning and the development of critical and creative thinking
- Ability to select and evaluate ICT-based learning materials and software and integrate them into their teaching
- Ability to effectively employ ICT applications to support specific syllabus outcomes, content and processes
- Ability to design a range of ICT-based assessment tasks linked to curriculum outcomes
- Understanding of the collaborative and student led nature of effective ICT-mediated learning

Using information

- Understanding of the issues of appropriate access to, and verification of, information gained from a variety of
- sources including the Internet and other digital resources
- Ability to critically evaluate, retrieve, manipulate and manage the information from a range of digital sources including social media

Technical skills

- Understanding of the range of applications and adaptive technologies available to support students with special needs
- Ability to construct and manipulate texts and images, create presentations and store and retrieve digital information for classroom and on-line learning
- Ability to use appropriate digital resources for student profiling and reporting, lesson preparation and class/faculty administration
- Ability to safely and effectively use ICT in online collaborative environments

Program Design

Initial teacher education programs may address these issues in specific units of study or by embedding them across the program of study.

The Ministers' priority areas link to the Australian Professional Standards for Teachers (Graduate stage). All professional standards have a bearing on the skills and abilities required by the priority areas. The ICT priority area is specifically relevant to the Standards noted below.

Standard 1: Know students and how they learn **Focus area 1.2:** Understand how students learn	**Standard 2:** Know the content and how to teach it **Focus area 2.6:** Information and Communication Technology (ICT)	**Standard 3:** Plan for and implement effective teaching and learning **Focus area 3.4:** Select and use resources	**Standard 4:** Create and maintain supportive and safe learning environments **Focus area 4.5:** Use ICT safely, responsively and ethically

(Board of Studies Teaching and Educational Standards, 2014)

APPENDIX 4: WEB ACCESSIBILITY GUIDELINES

WCAG 2 at a Glance

Perceivable

- Provide **text alternatives** for non-text content.
- Provide **captions and other alternatives** for multimedia.
- Create content that can be **presented in different ways**, including by assistive technologies, without losing meaning.
- Make it easier for users to **see and hear content.**

Operable

- Make all functionality available from a **keyboard**.
- Give users **enough time** to read and use content.
- Do not use content that causes **seizures**.
- Help users **navigate and find content.**

Understandable

- Make text **readable** and **understandable**.
- Make content appear and operate in **predictable** ways.
- Help users **avoid and correct mistakes**.

Robust

- Maximize **compatibility** with browsers and user tools.

This page provides a summary of Web Content Accessibility Guidelines (WCAG 2.0); however, it is paraphrased and it is not a definitive version.

Please see the following key resources for learning and using WCAG 2.0:

- WCAG Overview — www.w3.org/WAI/intro/wcag
- How to Meet WCAG 2.0: A customizable quick reference to WCAG 2.0 requirements
- (Success Criteria) and techniques — www.w3.org/WAI/WCAG20/quickref
- Online at www.w3.org/WAI/WCAG20/glance

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