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Working Toward a Future-Resilient Technologies Curriculum

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Abstract

The Australian Curriculum: Technologies has been designed in response to pressing national priorities, including food and water security, population health and wellbeing, the growth of the knowledge economy, and the continual transformation of engineering and manufacturing. These priorities underpin the inclusion of two central subjects—Design and Technologies and Digital Technologies—supported by contextual applications across the Foundation Primary year to Year 10. The curriculum is intended not only to be comprehensive but also integrative, fostering meaningful cross-disciplinary connections that provide opportunities for innovation in areas such as food and fibre production and Science, Technology, Engineering and Mathematics (STEM).

This paper synthesises key elements of the Australian Curriculum: Technologies and the Digital Literacy general capability, with a particular focus on building a future-resilient curriculum. When developing these documents, international policy frameworks and research perspectives were considered, highlighting the global importance of digital literacy as a threshold capability for lifelong learning.

This paper also examines the challenges posed by declining ICT literacy in Australian students, the evolution from the ICT capability to the Digital Literacy capability, and the conceptual pillars of Computational, Design, and Systems thinking. Attention is given to the importance of a whole-school approach to implementation, the need for teacher professional learning, and the integration of ethical, sustainable, and futures-focussed practices. Ultimately, this paper argues that the Australian Curriculum: Technologies is central to preparing young Australians, not only for probable futures, but also to equip them to shape

their own preferred futures that are sustainable, ethical, and adaptable to rapid technological change.

Keywords

Australian Curriculum, Technologies education, Design and Technologies, Digital Technologies, Digital Literacy, curriculum policy

Introduction

Framing Future-Resilient Technologies Education

Over the past two decades, Australian education has been required to adapt to significant changes in social, economic, and technological contexts. The shift toward a knowledge economy, the rapid pace of digital disruption, and global challenges such as climate change and lack of food security demand new ways of thinking about curriculum. In this context, the Australian Curriculum: Technologies was developed to equip students with the knowledge, understanding and skills needed for resilience in the face of uncertainty.

The idea of a future-resilient curriculum is grounded in the recognition that today's students will face a future that is increasingly complex, unpredictable, and mediated by technology. Preparing students to be adaptable problem-solvers, discerning decision-makers, and innovative designers became an educational imperative for curriculum developers. Resilience in this sense is not about maintaining the status quo but about developing the capacity to anticipate, adjust, and thrive in contexts of change.

At the centre of this curriculum are two subjects: Design and Technologies, which focuses on Design thinking and the production of tangible solutions, and Digital Technologies, which emphasises Computational thinking and the construction of digital systems (ACARA, 2022a). Both subjects also provide opportunities for developing Systems thinking. These different 'Thinking' approaches encourage students to analyse problems from multiple perspectives, iterate and prototype solutions, understand interconnected systems, and identify opportunities for innovation (Blundell et al., 2025). When taught through meaningful, authentic contexts, they can transform students from passive consumers of technology into proactive designers of preferred futures (Bower et al., 2025).

Together, the two Technologies subjects provide students with a balanced exposure to both material and digital problem environments. Additionally, the curriculum does not treat digital literacy in isolation; it promotes integration across all Learning areas through the Digital Literacy capability and Australian Curriculum support initiatives such as Curriculum connections resources, enabling students to transfer knowledge and apply skills in authentic contexts.

The Development of the Australian Curriculum: Technologies

The design of the Australian Curriculum: Technologies has been shaped by national priorities that reflect Australia's economic and social challenges. Priorities such as food and water security, health and wellbeing, the knowledge economy, and the shifting nature of manufacturing and engineering have guided the structure and content of the curriculum. These priorities ensure that Technologies education remains grounded in authentic national needs rather than abstract competencies.

The curriculum is structured around two subjects, each with its own distinct emphasis, yet designed to complement the other: Design and Technologies; and Digital Technologies, outlined in the following sections.

Design and Technologies

This subject develops students' capacity to identify problems, generate ideas, and apply Design thinking to produce solutions. It also incorporates specific contexts: food specialisations, food and fibre production, engineering principles and systems, and materials and technologies specialisations. These contexts provide content relevance and help situate design processes as a response to pressing societal issues.

Digital Technologies

This subject focuses on Computational thinking, abstraction, data representation, algorithms, and system design. It requires students to build, test, and evaluate digital solutions. Privacy, security, and ethical considerations are central, reflecting the increasingly pervasive role of digital systems in personal and professional life.

The interplay of these two subjects fosters what the curriculum writers describe as integrative learning, whereby students can move between physical and digital environments, recognising the interdependence of material and virtual systems in contemporary society (ACARA, 2022a).

A future-resilient curriculum requires that learning be grounded in contexts that are both authentic and future-oriented. The Design and Technologies curriculum specifies four such contexts (ACARA, 2022a):

- Engineering principles and systems.
- Food and fibre production.
- Food specialisations.
- Materials and technologies specialisations.

These contexts anchor abstract skills in practical realities, providing opportunities to address challenges such as sustainability, health, and resource management. They also emphasise the importance of ethical decision-making. For example, while wearable devices offer opportunities for health monitoring, they raise questions about surveillance, wellbeing, and privacy. The curriculum encourages students to reflect critically on such dilemmas, encapsulated in the principle that just because we can, does not mean we should.

This integrated approach is a defining feature of the Australian Curriculum: Technologies as it also emphasises connections with other Learning areas. For example, projects in food and fibre production may link Technologies with Science and Geography, while engineering principles naturally align with Mathematics and Science. ACARA's STEM Connections project research on integrating Science, Technologies, Mathematics, and Work Studies in Years 9 and 10 demonstrated that such interdisciplinary approaches allow students to engage with diverse perspectives which can support the transfer of knowledge, enhance student engagement (ACARA, 2016), and encourage students to develop the skills to co-construct responses to complex, often 'wicked' problems (Veltman et al., 2019).

The Technologies curriculum adopts a futures-oriented framework, encouraging students to distinguish between probable, possible, and preferred futures (ACARA, 2022a).

- Probable futures are those most likely to occur given current trends.
- Possible futures are alternatives that may emerge.
- Preferred futures are ethically desirable outcomes that students are encouraged to design toward.

This framework, supported by computational, design, and Systems thinking, cultivates the anticipatory capacity required for resilience. By asking students to consider long-term impacts, risks, and social implications, the curriculum positions them as active agents in shaping technology rather than passive recipients of change (QCAA, 2025). By encouraging integration, the curriculum positions Technologies as a connector discipline—one that helps students see the links between abstract concepts and practical applications, and between disciplinary silos and real-world challenges. This integration is key to building resilience, as it mirrors the ways problems are encountered outside school: rarely confined to one siloed discipline, but instead requiring multifaceted perspectives.

Digital Literacy in the Australian Curriculum (Version 9.0)

One of the most notable updates in the Australian Curriculum (V9.0) (ACARA, 2022b) is the establishment of Digital Literacy as a general capability, replacing the earlier focus on the ICT capability (V8.4) (ACARA, 2017) This update included its reframing as both underpinning the subject of Digital Technologies and supporting the development of digital literacy across the curriculum (ACARA, 2025b). The rationale for Digital Literacy describes how "Together, Digital Literacy and Digital Technologies give students the opportunity to become discerning users, productive creators, critical analysts and effective developers of digital solutions" (ACARA, 2022a, 13#).

The Digital Literacy general capability (V9.0) is organised into four interrelated elements (ACARA, 2022b):

- *Practising digital safety and wellbeing* – recognising and responding to risks, protecting privacy, and maintaining health in digital environments.
- *Investigating* – locating, analysing, and evaluating information from digital sources.
- *Creating and exchanging* – using digital tools to design, innovate, and communicate ideas effectively.
- *Managing and operating* – developing operational competence with digital systems and applying efficient strategies for their use.

These elements have been arranged as a cohesive, developmental learning continuum from Foundation to Year 10, with progression marked by increasing independence, complexity, and adaptability.

This shift from the ICT Capability (V8.4) to the Digital Literacy general capability (V9.0) reflects both national developments and international recognition that Digital Literacy must extend well beyond technical proficiency. The Alice Springs (Mparntwe) Education Declaration (COAG Education Council, 2019) commits to ensuring that all young Australians are productive, informed users of technology and capable of adapting to emerging tools. This national policy highlights digital capability as integral to educational equity and workforce preparedness.

Internationally, the United Nations' 2030 Agenda for Sustainable Development (United Nations, 2015) positions digital literacy as a key component of lifelong learning. Similarly, the European Union's Key Competences for Lifelong Learning (European Commission, 2007) recognises digital competence as essential for participation in society and the economy.

Industry bodies have echoed this emphasis. The Foundation for Young Australians (FYA, 2015; 2017) identified digital literacy, creativity, and critical thinking as core transferable skills underpinning Australia's future prosperity. Hajkowicz et al. (2016) similarly argued that to participate in the future workforce, Australians will need to be literate, numerate, and digitally literate, describing these as threshold requirements for employment.

These frameworks collectively reinforce that digital literacy is not a niche competence but a fundamental capability for citizenship, work, and lifelong learning. By aligning with these frameworks, the Australian Curriculum ensures that students are not only competitive in the global economy but also equipped to navigate the ethical and social implications of technological change.

Contemporary Understandings and Evolving Foundations of Digital Literacy

The conceptual foundations of digital literacy capability have been shaped by decades of evolving scholarship, reflecting technological advances and changing understandings of literacy itself. The term gained early prominence through Gilster's (1997) definition of digital literacy as, "the ability to understand and use information presented in digital formats" (p. 1). At that time, digital tools (hardware and software) were largely confined to desktop computers in specialised settings such as dedicated computer labs. Literacy in this sense referred primarily to navigating digital information systems and making sense of hyperlinked, multimedia content.

Subsequently, the proliferation of mobile technologies, the ubiquity of the internet, generative artificial intelligence systems, and the rise of social media have transformed the meaning of digital literacy.

Researchers such as Belshaw (2012) have argued that digital literacy encompasses not just functional skills but also cultural, cognitive, and critical dimensions. Belshaw also noted the proliferation of related terms: media literacy, information literacy, communication literacy, which reflect attempts to capture the breadth of skills needed but sometimes create conceptual overlap and definitional ambiguity. More recent work continues this line of critique: Zhang and Zhang (2024) argue that digital literacy now operates as a 'multi-layered construct' influenced by platform ecosystems, AI-driven content, and algorithmic mediation, requiring continual re-theorisation in response to emerging technologies. Similarly, Yang et al. (2025) highlight that digital literacy frameworks increasingly integrate socio-emotional and ethical capacities, particularly in AI-saturated environments.

As technologies and contexts diversified, researchers argued for broader, more nuanced views of digital literacy. For example, Pangrazio et al. (2020) demonstrate how definitions of digital literacy across different language contexts have shifted from purely technical skills to include critical, ethical and cultural dimensions of participation. Cain and Coldwell-Neilson (2024) describe 'digital fluency' as a dynamic capability continuum, emphasising the active and continuous adaptation of learners' digital practices in response to evolving technologies.

Ng (2012) highlighted that being able to use digital tools does not necessarily equate to being digitally literate, emphasising the importance of critical and creative engagement. He argued that digital natives may be comfortable using digital tools, but that does not guarantee creative or critical engagement with technology. Contemporary Subsequent work reinforces this view: for example, List (2019) found that many students overestimate their digital readiness, especially in critical evaluation of digital content. Redecker (2020) proposes that digital-citizenship frameworks must include metacognitive and problem-solving dimensions as young people navigate algorithmically curated environments. Together, these studies support Ng's argument that digital literacy involves purposeful, critical and creative engagement rather than mere operational proficiency.

Several researchers emphasise that digital literacy should be understood as a mindset and attitude, not just a fixed set of skills. For instance, Jo Coldwell-Neilson's (2020) work on the Decoding Digital Literacy framework positions digital literacy as adaptive and embedded in disciplinary curriculum design and institutional strategy. Building upon this, the digital-capability continuum described by Cain & Coldwell-Neilson (2024) reinforces the view that digital literacy must be flexible, transferable and continuously updated. This aligns with the concept of digital literacy as foundational to lifelong learning and resilient adaptation in an ever-changing technological environment.

Other researchers have stressed the need to distinguish between passive use of digital platforms and active, critical literacy. Gay (2019), for example, emphasised that a 'digital lifestyle' should not be confused with digital literacy, since the latter requires critical decision-making and the capacity to evaluate information. More recent research amplifies this concern. Pangrazio et al. (2020) argue that young people often display high levels of digital participation but comparatively low levels of critical literacy, particularly in relation to platform politics and algorithmic personalisation. A concern is noted that habitual engagement with digital platforms may disguise significant deficits in critical analysis, data literacy, and understanding of persuasive design. This distinction underscores the importance of moving beyond functional competence to foster the critical literacies that enable young people to be not just consumers but also producers and evaluators of digital content in increasingly automated and data-driven environments.

Performance and the Challenge of Declining ICT Literacy

Despite this significant curriculum review, Australian students' ICT literacy has stagnated or declined. The National Assessment Program–ICT Literacy (NAP–ICTL) (ACARA, 2025a) has provided data since 2005, offering insight into trends.

The 2022 results were particularly concerning: only 55% of Year 6 students met the proficiency standard, while just 46% of Year 10 students achieved proficiency—the lowest proportion since testing began (AITSL, 2024). This represents a decline from 2008, when 66% of Year 10 students met the benchmark.

This decline cannot be attributed to lack of exposure to devices, as digital tools are now commonplace. Instead, it reflects deeper issues (ACS, 2024; AITSL, 2023):

- Unequal access to high-quality teaching of Digital Technologies.
- Variability in school capacity and infrastructure.
- Teacher confidence and professional learning needs.
- The challenge of keeping curriculum and pedagogy aligned with rapid technological change.

Findings highlight a critical gap between policy aspirations and classroom realities, underscoring the need for systemic approaches that build capacity across schools and provide consistent opportunities for digital capability development.

Assessment of digital capability has evolved from national sample testing to embedded approaches within the curriculum. Earlier NAP–ICT Literacy tests provided baseline data but are now considered outdated. In Version 9.0, student digital literacy is assessed through achievement standards and portfolios across subjects (QCAA, 2025). For example, by Year 10, students are expected to plan, implement, and evaluate digital solutions while demonstrating responsible management of privacy and security. This embedded approach ensures that digital literacy is lived and demonstrated across contexts, rather than confined to one-off assessments.

Moving Forward: Whole-School Approaches to Building Capacity

Addressing these challenges requires a whole-school approach. In 2012, the ACARA Digital Education Advisory Group identified several priorities for schools, including:

- Leadership in contemporary pedagogies.
- Professional development to build teacher capabilities.
- Expanding assessment and reporting to include digital dispositions.
- Enhancing access to teaching and learning resources.

Initiatives such as ACARA's Digital Technologies in Focus (DTiF) project (ACARA, 2021) exemplify how collaboration and targeted support can enhance school capacity. DTiF demonstrated that with curriculum officers providing guidance, all schools, including those in disadvantaged settings can build teacher confidence and improve student outcomes.

Embedding digital literacy across all Learning areas is also vital. Given the limited dedicated time for Digital Technologies, all teachers must be made aware of the need to integrate Digital Literacy into their subjects, reinforcing the content through 'just-in-time' instruction and explicit inclusion in assessment rubrics.

Pedagogical Implications: Teaching for Resilience

To translate curriculum intentions into meaningful outcomes, pedagogy must prioritise assessment of prior knowledge, Project-based Learning (PBL), and 'just-in-time' learning.

Lipton (2009) observed that the greatest challenge for any thinker is stating the problem clearly. Teachers face a parallel challenge: assessing what students already know before designing instruction. Questionnaires on students' access to and use of digital tools, alongside assessments of Computational thinking, can provide data to guide targeted teaching.

Project-based learning (PBL) is particularly effective in the delivery of Technologies content, as it integrates Computational and Design thinking with real-world problem solving. PBL fosters collaboration, creativity, and resilience by engaging students in authentic, open-ended challenges. 'Just-in-time' instruction ensures that digital competencies are reinforced across subjects, maximising limited curriculum time while embedding Digital Literacy as a general capability expectation.

Toward a Future-Resilient Technologies Curriculum

The Australian Curriculum: Technologies was intentionally designed as a forward-looking framework to prepare young people for an uncertain and rapidly changing world. Central to its design is the recognition that a future-resilient curriculum must cultivate dispositions that enable students to thrive not only in the present but also in future industries, professions, and social contexts that may not yet exist. This moves the curriculum beyond a narrow focus on technical skills acquisition toward developing adaptable, creative, and ethically aware students who can respond to complexity with confidence (ACARA, 2022a).

Additionally, by exploring the Technologies Learning area knowledge and content while working on projects, students develop resilience and adaptability. This requires more than technical proficiency; it involves cultivating habits of mind that allow students to reframe challenges, transfer knowledge across contexts, and acquire new capabilities when circumstances demand (Selwyn, 2022).

Equally significant is the development of ethical understanding, which ensures that the application of technology is informed by well-considered future-focused thinking. This encourages students to consider sustainability, equity, and long-term social consequences when finding solutions, as the products and services they create can have enduring impacts on communities and environments (Australian Government, 2019). In this respect, the curriculum reflects international frameworks that stress the importance of responsible innovation and ethical AI usage (OECD, 2019).

The curriculum also highlights creativity and innovation, encouraging students to move beyond consumption of technology toward generating novel solutions to authentic problems. This framing positions students as agents of change, capable of addressing issues that matter in their lives and communities (de Bruin & Harris, 2017). Complementing this is project work and collaboration, which are prioritised as essential capabilities for the contemporary workforce (FYA, 2017).

Additionally, developing digital literacy is integral to fostering student efficiency and confidence. In a world characterised by misinformation, online harm, and algorithmic bias, students must learn to critically engage with digital environments, protect their wellbeing, and participate responsibly and effectively in networked communities (eSafety Commissioner, 2020).

In this way, the Australian Curriculum seeks to foster more than technical proficiency. It positions students' education as a catalyst for cultivating ethically aware, adaptable, and creative citizens who are equipped to navigate uncertainty and to contribute positively to shaping future societies. A future-resilient curriculum therefore does not simply prepare students to participate in the future; it empowers them to design and influence it.

Conclusion

The Australian Curriculum: Technologies represents a significant step toward building educational resilience in a time of rapid technological and social change. By also embedding Digital Literacy explicitly in the subject Digital Technologies as a general capability, promoting cross-disciplinary integration, and encouraging futures thinking, the curriculum equips students to navigate uncertainty and to design ethically preferable futures.

Challenges remain, particularly the decline in ICT literacy and disparities in school capacity. Addressing these requires systemic commitment to teacher professional development, whole-school approaches, and equitable resource provision.

Nevertheless, the curriculum provides a strong foundation for preparing young Australians to thrive in the future. It positions them not only as competent users of technology but also as critical thinkers, innovative designers, and responsible citizens capable of shaping the technological landscapes of tomorrow.

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