

ACARA Submission

Inquiry into the use of generative artificial intelligence in the Australian education system

14 July 2023

The House Standing Committee on Employment, Education and Training adopted an inquiry into the use of generative artificial intelligence in the Australian education system on 24 May 2023 following a referral from the Minister for Education, the Hon Jason Clare MP.

ACARA's submission focusses on how the new v9 Australian Curriculum can be used to teach students about the key mathematical, scientific and technological concepts that underpin the development and use of artificial intelligence, and to provide opportunities for discussing its ethical use.

ACARA welcomes the opportunity to provide the House of Representatives Standing Committee with a submission in relation to the use of generative artificial intelligence (AI) in the Australian education system. This submission has a focus on the following considerations as part of the Terms of Reference for the inquiry:

1. the strengths and benefits of generative AI tools for children, students, educators and systems, and the ways in which they can be used to improve education outcomes
2. the risks and challenges presented by generative AI tools, including in ensuring their safe and ethical use, and in promoting ongoing academic and research integrity
3. international and domestic practices and policies in response to the increased use of generative AI tools in education, including examples of best practice implementation, independent evaluation of outcomes and lessons applicable to the Australian context
4. recommendations to manage the risks, seize the opportunities and guide the potential development of generative AI tools, including in the area of standards.

AI in the Australian Curriculum

1 The strengths and benefits of generative AI tools for children, students, educators and systems

- 1.1 ACARA believes that it is essential for students to learn about and harness AI and other emerging technologies that are part of our daily lives, and this content is included in the F-10 Australian Curriculum.
- 1.2 For students to understand what AI is and how it works, they need to be taught about the concepts of chance, data and algorithms, to explore the risks and challenges of AI, its diverse applications and how to leverage it for positive impact as either users of AI or designers of digital solutions.
- 1.3 The foundational knowledge, skills and understanding of AI are part of the Australian Curriculum: Mathematics and Technologies.
 - In Mathematics it is acknowledged that “The modern world [which] is influenced by ever expanding computational power, digital systems, automation, artificial intelligence, economics and a data driven society.” The Version 9.0 Australian Curriculum includes content in relation to number, algebra, measurement, space, statistics and probability. The new computational thinking content has explicit reference to the computational thinking process involving decomposition, abstraction, pattern recognition, models and simulations, algorithms and generalisation.
 - In the Technologies learning area and specifically Digital Technologies subject in this learning area there is reference to automation, emerging technologies and ethical frameworks. The Version 9.0 Australian Curriculum includes content in relation to digital systems, data representation, acquiring, managing and analysing data, abstraction, algorithms, and privacy and security.
- 1.4 Both learning areas provide knowledge, understanding and skills about the AI core concepts of chance, data and algorithms. Explicit content developed within these 2 learning areas provides students with knowledge and skills to understand the risks and challenges of AI, its diverse applications and how to leverage it for positive impact as either users of AI or designers of digital solutions.

1.5 The Australian Curriculum is designed to enable teachers to develop teaching and learning programs that make connections across learning areas, the general capabilities and the cross-curriculum priorities. The following examples demonstrate how AI cuts across all areas of the curriculum and provides authentic opportunities for students to apply the foundational knowledge developed in Mathematics and Digital Technologies.

- Other learning areas:
 - Science, Humanities and Social Sciences and Health and Physical Education all share a focus on data. These learning areas offer opportunities for students to develop skills and knowledge in collecting, interpreting, ordering and questioning data and information, developing the ability to look for patterns and trends.
 - English, allows students to explore text structure and organisation of language features.
 - The Arts provides opportunities for an ethical lens to be applied through copyright and intellectual property.
 - English as a learning area allows for critical thinking to be practiced through the lens of students as critical consumers of information. These critical thinking skills are developed as building blocks from the Foundation year level through to year 10.
 - Other subjects such as HASS, Civics & Citizenship and Health and physical education can support the learning obtained through English by providing different avenues for applying critical thinking skills.
- General capabilities, in particular:
 - Digital Literacy: how, where and why we use AI
 - Ethical Understanding: whose data we input, how and why it is used, and issues of permissions, copyright and Indigenous Cultural and Intellectual Property (ICIP) around its use
 - Critical and Creative Thinking: when, where and why we could or should use AI
 - Numeracy: pattern recognition, abstraction and generalisation used to apply mathematics to create AI.
- Cross-curriculum priority - Sustainability
 - This helps learners understand how designing and using AI systems can positively impact energy consumption/carbon emissions and materials usage, improve productivity and profit in business and economics, and play a part in disseminating information that may encourage others towards more sustainable practices. Conversely, the use of servers that power AI may have a negative impact on a sustainable future.

1.6 The evolution of AI is rapid and ongoing. The wide variety of AI available in 2023 is used for a multitude of purposes across many domains including security systems, autonomous vehicles, chatbot programs like Chat GPT, software used to translate texts into other languages, virtual assistants operated by speech recognition, weather warning systems and self-operated checkouts at supermarkets.

1.7 All AI systems use data and algorithms in various ways. Some follow instructions to carry out defined tasks. Others use algorithms that are designed to continuously update and improve the capacity and function of the system over time (Machine Learning or ML).

- 1.8 AI can be described as digital systems that employ logical processes that mimic intellectual characteristics of human beings: the ability to reason, generalise, make meaning or to learn from experiences.
- 1.9 Students need to be able to understand how AI works and the implications for daily life, not simply how to use one form of AI to complete a task. For example, knowing how the algorithms used by global network platforms – including social media - work to provide suggestions about what content a user should consume is vital for understanding that this can reinforce bias and prejudice, which is antithetical to democratic dialogue. They will be much better consumers of AI with the knowledge and skills that are incorporated into the Australian Curriculum. It should be noted that in the Australian Curriculum the term AI does not appear regularly, but as outlined above, the underpinning concepts and content of AI is strongly embedded, and it is expected these will be taught to all students.

2 The risks and challenges presented by generative AI tools

- 2.1 Emerging technologies have disrupted and presented challenges to education policymakers, teachers and students prior to the current century, and continue to do so with an ongoing and increasing intensity. The Australian Curriculum serves an important purpose in response to the impact of generative AI. The revised Australian Curriculum, Version 9.0 has undergone an extensive review process, drawing on international research, the expertise of writing teams, critical feedback and wide public consultation. This approach has allowed for a future focus on what students should learn, including the purpose, construction and use of emerging technologies such as AI and prepare for those that are yet to be developed and experienced.
- 2.2 The curriculum provides educators who implement it with opportunities to provide contextual examples of specific digital tools to their students. Teachers may mitigate risk by not only modelling the appropriate use of AI but also amplifying the message of engaging with AI for a beneficial purpose and the critical evaluation of risks when choosing to do so. This applies to all teachers across all learning areas engaging with the general capabilities in the curriculum such as Ethical Understanding, Digital Literacy, Critical and Creative Thinking, and Personal and Social capability.
- 2.3 Specific new content in the Australian Curriculum: Digital Technologies Version 9.0 provides an increased focus on students learning about risk management through privacy and security.

3 Practices and policies in response to the increased use of generative AI tools in education

Curriculum versus policy and pedagogy

- 3.1 The Australian Curriculum describes *what* students should learn. It contains content that prepares students to understand both how AI works and how it can be used. The building blocks of AI include chance, data, and algorithms. The function and purpose of AI can be explored in every area of the curriculum and are exemplified in our everyday lives (as outlined above in response consideration 1: *The strengths and benefits of generative AI tools for children, students, educators, and systems*)
- 3.2 While the Australian Curriculum can be described as a policy document explaining what is to be taught to every Australian student, this is separate from the question of “How will AI, as a ubiquitous technology, impact education policy and pedagogy?” Policies for school operations and thus the implementation of the Australian Curriculum are the remit of the state and territory educational jurisdictions and sectors.

How students learn about AI in the Australian Curriculum and the reason for this approach

- 3.3 Artificial intelligence (AI) was considered during the research phase when writing the Australian Curriculum: Digital Technologies, Version 9.0. While it is not new, AI is widely considered an emerging technology; it continues to change in its design, form and application. Students with the knowledge, understanding and skills of AI-related concepts will be better equipped for their futures.
- 3.4 The intent of the curriculum is to provide fundamental knowledge, skills and processes to all students from Foundation to Year 10. This approach allows teachers to remain contextual and contemporary in the delivery of curriculum content and to engage students in learning through relevant examples and experiences. Whether students are consumers of AI or creators of AI programs and systems, they will be both educated and adaptable to change.
- 3.5 The Australian Curriculum: Digital Technologies provides knowledge about the components of AI (data and algorithms) and the skills that underpin the processes by which AI is designed, structured and implemented for a purpose (how AI works and its application as a digital solution). Revisions to the curriculum, including the introduction of the core concept of Privacy and security along with opportunities for students to benefit from the interconnectedness of shared content with Mathematics, enable students to explore the diversity of AI as users and as designers.
- 3.6 Key connections with the general capabilities of Digital Literacy and Ethical Understanding strengthen choices students might make in selecting, managing and protecting data owned by people, their intellectual property and their data privacy. The Critical and Creative Thinking general capability plays an equally crucial role in the consideration of AI and digital solutions students either use or develop themselves.
- 3.7 The Australian Curriculum: Mathematics, Version 9.0 provides the necessary mathematical knowledge and skills that underpin the processes of AI (how it works) and the logical ways of thinking and reasoning mathematically that AI mimics as an artificial intelligence. Revisions to the curriculum, including the introduction of new content such as networks, algorithms, modelling and experimenting with functions and probability simulations, have provided more learning opportunities for all students to build the essential foundations for understanding the mathematics behind AI systems.
- 3.8 The Probability strand of the Australian Curriculum: Mathematics, develops ways of dealing with uncertainty and expectation, making predictions, and characterising the chance of events, or how likely events are to occur from both empirical and theoretical bases. This enables students to understand contexts involving chance and to build mathematical models surrounding risk and decision-making in a range of areas of human endeavour. These include finance, science, business management, epidemiology, games of chance, computer science and artificial intelligence.
- 3.9 Key connections between Australian Curriculum: Mathematics, Version 9.0 and the general capability of Ethical Understanding provide opportunities for students to apply mathematics when making ethical decisions concerning data, recognising intentional and accidental errors or distortions, and questioning the validity in propositions and inferences. These skills, combined with the content knowledge of probability and statistics, are essential to thinking critically about the output of AI systems.

4 Recommendations to manage the risks, seize the opportunities and guide the potential development of generative AI tools

- 4.1 ACARA understands the parallels that exist between curriculum implementation and teacher professional development in building capacity for teaching and learning with and about AI. Through the provision of professional development, with a focus on the intent of the curriculum, teachers will gain an equivalent understanding to that of their students about the purpose, use, structure and risks of using generative AI and other types of AI more broadly. ACARA will be developing some professional learning modules and would be keen to partner with jurisdictions and sectors and teacher professional associations to support teachers to plan and implement the curriculum relevant to understanding AI.
- 4.2 ACARA recommends that all materials designed to guide educators about the use of AI should provide clear definitions of what we mean by AI and generative AI, and make it clear that there are a range of AI types; for example, Chat GPT is only one example of generative AI.
- 4.3 Students have preferences for using digital tools creatively and responsibly, to try new things and to fail as part of personal growth. This should be considered in the context of how the curriculum supports them to do this and how using and designing AI may play an important part in engaging students in their learning and providing opportunities for their future lives.
- 4.4 ACARA is currently providing information to key educational stakeholders to support them with questions about AI in the Australian Curriculum and is planning to develop more detailed information to show why it is important to teach about AI while recognising that teachers and students are using it, in and out of the classroom. The ability to have discussions about the ethical consideration (eg cheating) and the potential limitations (eg if you don't know the content how will you know whether Chat GPT is correct), but also the benefits of AI (eg retrieving and synthesising a large volume of information) is essential.
- 4.5 There is considerable concern about students using AI to cheat on tasks set by the teacher, and particularly assessment tasks. ACARA as the assessment authority could consider developing a range of strategies/suggestions to use AI without the concern about cheating.
- 4.6 ACARA has been tasked with exploring the development and delivery of optional support resources to implement the national curriculum as part of Action 19 in the National Teacher Workforce Action Plan. There may be the opportunity to look at the synergies between future work related to AI and activities related to Action 19.
- 4.7 ACARA could provide more explicit advice on how the English curriculum can support students to be more critical of information they read and are exposed to when using digital systems. This could also include highlighting how the critical and creative thinking general capability can be addressed as part of this approach.