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Artificial intelligence in education

19 May 2020

Artificial intelligence (AI) is set to transform society in Aotearoa New Zealand. AI will change:

1. **Why we teach**
   As the needs for skilled employment and citizenship skills change, the fundamental aims of education are changing.
2. **What we teach**
   New emphases are emerging for the content, skills and values promoted in curricula.
3. **How we teach**
   As AI technologies advance, the activities and practices of teaching and learning – and even what constitutes a classroom – are evolving. Additionally, the timing and frequency of engagement with formal education may shift during an individual's life.

Recommendations

- The development of personalised learning platforms and intelligent tutoring systems is happening now, although they are not widespread yet. We currently have a window of opportunity to influence the development of these products.
- Action is urgently needed to grow the AI talent pool in Aotearoa New Zealand, especially investing in homegrown expertise.
- The national curriculum must be widely and equally implemented, alongside addressing systemic inequalities in the education system. Infrastructure, hardware and the quality of resources provided by AI, as well as usage patterns of technology, must all be equitable.
- Changes to teacher preparation and professional development are urgently needed.
- AI is powered by data. We need to ensure we are collecting the right data and that it is accessible to encourage innovation – while being mindful of data sovereignty and privacy.
- To keep pace with other developed nations in the AI space, the New Zealand Government should develop a comprehensive AI research and development strategy for education.

At a glance

What is AI?

There is no single accepted definition of AI. Currently, AI can perform specific, narrow tasks very well, like playing chess or marking multiple-choice exams. However, we are still a long way off the generalised, creative AI that can perform any task, according to the AI Forum of New Zealand (AIFNZ).[1]

Why we teach

The fundamental reasons for education are twofold:

1. Preparing citizens with skills and knowledge for diverse forms of employment
2. Fostering human development and realising potential[2]

A 2015 analysis suggests that 46% (or 885,000) jobs in Aotearoa New Zealand are at risk of automation over the 20-year period to 2035.[3] However, AIFNZ assert that automation will not lead to mass unemployment, as changes will happen gradually and new forms of working will emerge.[1] Further, not all tasks that could be automated in theory will end up being automated in practice due to cost and uptake.[4]

Nonetheless, as more routine tasks are automated, the focus of education shifts away from job-specific preparation towards holistic development of humancentric skills and capabilities to continue learning.

What we teach

AI skills

AI specialists (and tech graduates generally) are in high demand worldwide.[5] To stay at the leading edge, Aotearoa New Zealand needs to develop a pool of workers skilled in AI development and implementation.

More broadly, we need to increase awareness and understanding of AI, algorithms and computer science principles – especially among young people who will enter an AI-driven society.

Other digital literacy skills

In addition to algorithmic thinking, digital literacy encompasses the ability to evaluate information critically. There must be a greater focus on such critical thinking skills to build students' resilience against the growing threats of online misinformation, bots and social media incubators of extreme views.

Skills that can't be automated

To prepare young people for an uncertain and changing job market, education curricula should focus on teaching skills that can't be replicated artificially, such as self-regulation, creative problem solving, empathy and collaboration. The New Zealand curriculum values many of these skills with notable success (compared with other countries).[6] However, New Zealand's educational inequality means that children from disadvantaged backgrounds may miss out on developing these essential skills.[7] Additionally, the Productivity Commission recently found "clear evidence of a systematic implementation failure of the national curriculum".[8]

How we teach

Lifelong learning

With rapidly changing technology, there will be a shift from the linear 'learn, work, retire' model to one that emphasises lifelong learning.[1] To facilitate rapid reskilling and retraining at different periods in life, educational opportunities and support systems must be in place appropriate to people of all ages and backgrounds.

Personalised learning

AI will also catalyse a shift away from mass, standardised learning towards more personalised learning. Intelligent tutoring systems will enable more efficient engagement with discrete and well-

defined parts of the curriculum. Meanwhile, greater student agency means students work at their own pace and identify areas to work on.[9] AI and other technological innovations can also help people with learning disabilities such as dyslexia.[10]

However, care is needed to avoid risks associated with AI – for example, entrenching outdated practices and narrowing the curriculum. Machine learning tends to favour standardised testing of fact-based knowledge, where there is a clear right or wrong answer.[2] We know that future citizens will need competencies that can't be tested in this way, such as creativity, teamwork and interpersonal skills.

AI offers an opportunity to move away from high-stakes summative assessment. More frequent formative assessments with an emphasis on development may become more prevalent.

The role of the teacher

Human teachers will remain at the heart of education.[11] AI may enhance teachers' productivity by taking over routine tasks or dealing with frequently asked questions. This will enable teachers to spend more time in dialogue and discussions with students focused on complex activities, as well as time for curriculum design and professional collaboration.

Ethical issues

Teaching and learning can be guided by historical data, real-time analytics and monitoring of student attention and emotions. However, collecting and maintaining such data, often with highly personal information, poses challenges.

- Cyber-security: large datasets are a target for cyber criminals.[12]
- Privacy: close monitoring of students may provide rich data but can be obtrusive. Similarly, providing access to datasets can stimulate innovation, but must be balanced with respect for individuals' privacy.
- Data sovereignty and governance: an issue of importance for Māori in particular, the Data Protection and Use Policy (DPUP)[13] guidelines and principles should be closely followed, and Te Mana Raraunga[14] (the Māori Data Sovereignty Network) consulted.
- Biases: Use of historical data can entrench pre-existing inequities. Similarly, an individual's personal biases and ideology can be transferred to neural networks.[15] To mitigate such biases, we need a diverse AI workforce that also considers mātauranga and te ao Māori.

Equitable access to technology is also an issue. The current COVID-19 pandemic has offered some opportunity to redress such issues, especially among Māori and Pasifika communities.

Reports, publications and policies

International

- **The Beijing consensus** was adopted during the International Conference on Artificial Intelligence and Education in May 2019. Published by UNESCO, it details 37 recommendations for addressing opportunities and challenges associated with AI in education.[16]
- The UK released the **AI sector deal** in 2019.[17] The comprehensive strategy includes £406 million for maths, digital and technical education to address shortages in the STEM workforce and to upskill teachers.

- Singapore's **National Artificial Intelligence Strategy** outlines a vision for 2030 and has identified five key projects, including 'Personalised education through adaptive learning and assessment'.[18]
- The **Pan-Canadian Artificial Intelligence Strategy** is a CAD$125 million programme to increase and enhance Canada's AI research capabilities and expertise.[19]
- In Australia, the Department of Industry, Science, Energy and Resources is developing an **AI ethics framework** and commissioned the data science arm of CSIRO, Data61, to produce an **AI technology roadmap**. Data61 has a PhD scholarship programme to support research in AI and machine learning, while the Department of Education has an online 'Digital technologies hub' with learning and teaching resources about AI.

More international AI strategies and policies

Aotearoa New Zealand

- **AIFNZ** has produced several publications with relevance to AI in education, including:
  - **Shaping a future New Zealand** – a 2018 report outlining the current state of AI in Aotearoa New Zealand.[1]
  - Towards our intelligent future – an **AI roadmap for New Zealand**. This 2019 report outlines a vision for AI adoption in Aotearoa New Zealand.[5]
  - **Trustworthy AI in Aotearoa: AI principles** – a set of five principles to guide the implementation of AI in an Aotearoa New Zealand context.[20]
- The **New Zealand Productivity Commission** released a draft report in January 2020 called 'Educating New Zealand's future workforce: Technological change and the future of work'. The report discusses how automation, and technology generally, will impact future teaching and learning.[8]

Selected AI products and platforms

- Amy is an AI-powered maths tutor developed by Aotearoa New Zealand company Jaipuna.[21] Amy is multilingual, provides real-time feedback and intuitive analytics. Amy has been used in schools across Auckland and Wellington. Amy is also available through iQualify for Schools.[22]
- Smart Sparrow's digital courseware platform uses algorithmic adaptivity to guide what students learn when.[23]
- Facial recognition has been trialled in two New Zealand tertiary institutions to track attendance.[24]
- A free education initiative offered by Vector uses an AI-powered avatar to teach students about renewable energy. Developed by Auckland-based Soul Machines, the 'digital teacher', named Will, can respond to facial expressions such as smiles as well as verbal questions and comments.[25]

More EdTech initiatives

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