NSW GOVERNMENT

EDUCATION FOR A CHANGING WORLD

STRATEGIC THEMES ARISING AT THE SECRETARY'S ROUNTABLES
2017

A global conversation is taking place about the potential for developing technologies, including Artificial Intelligence (AI), related machine learning technologies and robotics, to radically transform our world in the foreseeable future. From self-driving cars and autonomous delivery drones, to precision medicine and farming – few industries and human endeavours, including education, are likely to be unaffected by these developments.

In late 2016 the Department commenced the Education for a Changing World project to stimulate informed discussions about the policies and reforms that we may need to set in motion now to ensure education best prepares young people to successfully navigate a more complex and changing world.

To help inform the Department's thinking, Mark Scott, the Secretary of the NSW Department of Education, convened four roundtables in the first half of 2017. Leaders from Australian industry, business, tertiary education and NSW public schools were invited to discuss their different perspectives about what the future may hold, and what young Australians need from school education as a consequence of these predicted changes.

The first and second roundtables in particular gauged opinions from thought leaders from a range of industries, businesses, government bodies and universities. Topics included the implications of predicted technological change and developing global trends for Australia's economy and employment, and the skills that they think young people will need to thrive in that future world.

Educators from NSW public schools were represented in the first three roundtables.

The third roundtable in particular focused on NSW education practitioners and leaders who discussed how innovation can be developed, supported, recognised and scaled across the education system. A fourth roundtable gauged student opinions on these issues.

EMPLOYMENT IS CHANGING IN UNPREDICTABLE WAYS

Roundtable participants noted that while the pace and the impact of technological changes are difficult to predict, there is consensus that the world of the 2030s is going to be quite different from today. Australia's future economic security requires the leveraging of developing technologies and innovation to increase productivity, and education is viewed as a critical lever to achieving this.

Participants noted that across many industries the skillset and knowledge required of employees is already changing and that this trend is expected to intensify as industry increasingly looks to automation to drive productivity. In some sectors, entire job categories are disappearing due to automation in combination with other trends such as offshoring and globalisation. Within some companies the majority of remaining positions have become divided between customer-facing sales (interpreting and translating customer needs into an outcome) and highly technical positions.

Many roundtable participants predicted that technology would increasingly augment worker activity, thereby reducing the number of professionals and workers in particular industries, rather than necessarily replacing human labour entirely. For example, robots may routinely perform certain surgical procedures in the near future, and surgeons will need to become more proficient at working in a robotically-augmented

surgical environment. The skills implications of AI-supported automation will affect almost all professions and workplaces, but to different extents and at a different pace.

Although the rate of change in technology is rapid, the speed of uptake and its impact is dependent on whether infrastructure changes are required. It is faster to roll out software than to build physical infrastructure, and IT-based businesses can very quickly be scaled and disrupt markets in unpredictable ways. The cost for businesses to invest in robotic infrastructure may mean that some industries take longer to automate their workplaces compared with others.

Supporting a culture of innovation will need to be a whole-of-community endeavour; parents and school communities will need to empower and support students to think about alternative career paths given the potential for even traditionally 'safe' employment opportunities to be disrupted by technological change.

"I actually think that students have the confidence [to be entrepreneurial]. But they often come unstuck because of parents...who steer children towards so called 'safe professions'. We have as much a task to convince the parents that that's not necessarily smart."
(Industry participant, first roundtable)

STUDENTS NEED TO DEVELOP DEEP KNOWLEDGE AND KEY 'SOFT' SKILLS

There was general agreement among roundtable participants that although jobs will continue to change throughout the lifetime of today's children, what young people need is a broad set of key skills that can be continually built upon. The ability to re-engage with education throughout their careers, to understand and articulate their skills sets, to reskill and upskill as the demands of the workplace change, will be critical to succeed in the future labour market.

As one participant put it "[students are] going to be learning all their life, and that's a difference in mindset that we need to be building from right at the beginning of school". This will, more than ever, require resilience to change. It also requires a clear understanding of the implications of their subject choices in, and beyond, school.

The need to learn how to fail is a key part of this discussion. The willingness to try things and not be successful first time, to learn from mistakes and keep going was a continuing theme. One participant noted that "I got [to where I am] because I had one teacher who [taught]...through trial and examination, experimentation and failure. These build resilience and confidence in children to try things and if they fail massively, learn that it's okay".

Participants discussed the need for students to develop key skills such as communication, emotional intelligence, cultural competence and critical thinking. Tertiary education, which tends to be closer to the interface with industry skills needs, has had to rapidly respond to the changing world. Universities aim to develop key attributes in their graduates in combination with a deep knowledge of their study area. As one participant noted: "You really have to know something about something to

really know anything about anything". Real world problems are also being embedded into courses.

Opinions varied as to the extent to which schools should focus on these skills. Widening the skills assessed at school and the HSC was discussed. Some schools already do this in lower stages; however, there is a need for education systems to think carefully about assessment – what is assessed, as well as when and how – to better support students' outcomes.

Changing practice in Singapore was highlighted by some participants, who noted that they're shifting their focus from high stakes testing to embedding values in the classroom. This shift changes the role of the education system to one that prepares students for "the test of life, rather than a life of tests".

At their roundtable, students discussed at length the potential implications of predicted AI and technology change for their future skills sets. Students talked about a need for a better balance in senior secondary studies between deep content knowledge and skills that will be important in an AI-augmented workplace, such as problem solving, creativity and critical thinking.

When asked about the drivers for their subject selection and their career aspirations, while some spoke about how they were encouraged to study senior secondary subjects for which they had a passion ("study what you love"), others noted that the need to get a competitive university entrance rank carried greater weight in their decision than what subjects would be the most useful for their future career paths.

"[We make] sure our kids are as literate and numerate as they can be…but our thesis is that your children will be better doctors, lawyers … teachers and park rangers if they are exposed to experiences that round them as humans [such as] public speaking, sport and even peer support."

(Educator, third roundtable)

STEM SKILLS ARE IMPORTANT TO THE FUTURE WORKFORCE

A number of participants predicted that STEM skills will be essential to future careers to enable people to interact meaningfully with technology in their jobs and daily lives. It was also highlighted that philosophy students currently obtain jobs faster than STEM graduates.

Mathematical and computational thinking are important; however, there was debate amongst participants about whether HSC maths should be compulsory. It was acknowledged that this might help overcome the underrepresentation of girls in STEM courses, but pathways need to be available to those who are unable to do maths. Students could see the increasing importance of maths, but noted that the curriculum moves very quickly in schools making it hard to get an in-depth knowledge of each topic. A higher sense of engagement is achieved when maths is made more practical and applied. As one student noted, "we really need to delve into the greater beauty of mathematics… and make it less dry."

Educators agreed that the key to attracting students to STEM is great teaching, engaging students, and demonstrating the value of STEM skills. Project based learning can be a good way to engage with topics in depth; however it was cautioned that projects must be carefully designed so that weaker students in particular don't miss the content and learning outcomes. There was also some discussion about the need to improve STEM in primary schools.

Exposure to real world applications of STEM skills is important. For example, opportunities for students to interact with STEM professionals (particularly girls and women), discussing the real-world problems they investigate and what motivates them can be inspirational and are cherished by students. An industry professional highlighted that this helps students to appreciate the practical applications of subjects and increase their passion.

"The problem isn't that people aren't learning STEM, the problem is that the highest quality isn't being done."

(Tertiary educator, second roundtable)

INNOVATION CAN BE FOUND THROUGHOUT THE NSW PUBLIC SCHOOL SYSTEM

Many NSW public schools are rising to the challenge of ensuring that they are preparing their students for the future world. There is not a 'one-size-fits-all' solution to ensuring that students are engaged in their learning. Solutions need to suit the local context. Schools are using many innovative programs to engage students and to help them develop key skills as well as strong numeracy and literacy. Each school was at a different place in their journey of innovation, but a key theme was the importance of breaking down faculty silos, allowing collaboration both within and between schools, and sharing ideas.

Ensuring that teachers are well supported to innovate in their teaching is essential. Principals noted that innovation requires courage and many need more support in this, given there has traditionally been a focus on compliance at the system level. There is power in being a large system and this should work to support teachers and schools in their endeavours.

Many schools engage in partnerships with community organisations, universities and industry to help develop key skills, show students different pathways into the workforce and spark interest in subjects. Collaboration with industry, when motivated by giving back to the community, can be very rewarding for schools. One school leader noted that it had completely changed their technology faculty. However, red tape or financial constraints can hinder the development of these partnerships.

Educators noted that connecting students with their broader community helps students to build their own identity and place in the community. It helps students to find their passion and also develops the capacity of students to interact with other people. The example was given of an increase in student pride and resilience and engagement when the local Aboriginal language was taught to all students in a school with a large Aboriginal population.

"Good integration of industry with schools happens locally because they deal with a local issue and local community. If you plonk that solution on another community there can be a rejection until they've been through the same process of recognising that they also need to do something locally."

(Industry participant, first roundtable)

In all the roundtables, teachers were acknowledged to be key to ensuring that students succeed. Many participants agreed that high achievers and talented industry-trained professionals (who provide a diversity of perspectives and insight into industry) should be encouraged into teaching. Several schools highlighted that teachers with industry experience, and particularly technology skills, are invaluable but can be difficult to recruit. There was general agreement in several discussions that being able to move into teaching at different career stages, and acknowledging the experience and skills that professionals have is important. It was noted that there are programs in other countries that allow this.

TECHNOLOGY NEEDS TO BE WELL INTEGRATED INTO SCHOOLS TO SUPPORT TEACHING AND LEARNING

Many participants believed that technology and personalised learning systems will be able to assist teachers in diagnosing learning difficulties and engaging students in their learning; however, it is unlikely to replace human teachers. Human teachers can inspire and be role models to students in ways that technology cannot.

Educators noted that technology should be embedded into other subjects. Students (and teachers) need a deep understanding of how technology works, is designed, and the processes and logic behind it, rather than just how to use a particular device. Teachers need to be empowered to use and understand technology. There is variation between schools in how technology is used – in some schools it is well integrated, while in others the benefits are not realised.

Students noted the importance of understanding how computer programming works, even if they might forget the coding languages themselves. Many pointed to some of the innovative ways their teachers were using technology and 'flipped' classroom approaches to make learning more engaging and effective. Some risks around using technology in the classroom, such as not listening to the teacher in class as they could catch up with the content later, were also identified. The students commented on the human aspects of teaching and learning, and the way that technology could compliment and amplify, but not replace teachers. The students did not believe that robots could achieve what good teachers do – that is, inspire them to learn more. Furthermore, "while technology can be a tool used by teachers to help us learn more, …it can't replace our [own] drive and willingness to learn things."

EDUCATION FOR A CHANGING WORLD

The Department's Education for a Changing World project is examining the strategic implications that advances in technology will have for education. It aims to stimulate informed discussions about the policies and reforms that we may need to set in motion now to ensure education best prepares young people to successfully navigate a more complex world.

For more information, visit https://education.nsw.gov.au/our-priorities/innovate-for-the-future/education-for-a-changing-world

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