THE QUEENSLAND INDEPENDENT SECTOR IS BECOMING MORE DIVERSE

From the Executive Director

The latest enrolment data released by the Australian Bureau of Statistics (ABS)[1] is positive news for the Queensland independent schooling sector with a 3.2% increase in enrolments from 2018 to 2019.

The data based on the Commonwealth Census of Schools held in August 2019 reveals a record number of students enrolled in Queensland independent schools at 124,787. The 2019 sector growth at 3.2%[2] continues the improvement in enrolment growth since 2016 when the rate of 0.7% was the lowest annual growth for fifteen years (refer Figure 1).

The increasing sector enrolments confirms parental confidence in independent schooling in both the quality of education provided and the opportunities on offer to students.

Further strong growth in the independent sector is expected in 2020 partially driven by the exit of the Prep half cohort from the schooling system in 2019. This means in 2020 schools will see all year levels at their expected enrolment levels[3].

The State and Catholic schooling sectors in Queensland are also growing albeit at a slower rate than the independent sector. The 2018 to 2019 increase for state schools was 1.5% whilst for Catholic schools it was 1.4%.

A total of 833,564 students attended Queensland schools in 2019 (an increase of 14,095 students over 2018) with the independent sector accounting for 14.9% of these enrolments. State schools enrolled 67.2% of students with the Catholic sector accounting for 17.9%. The independent sector continues to have a higher proportion of enrolments in secondary education at 19.2%.

**Figure 1:** Percentage Increase in Queensland Independent Sector Enrolments
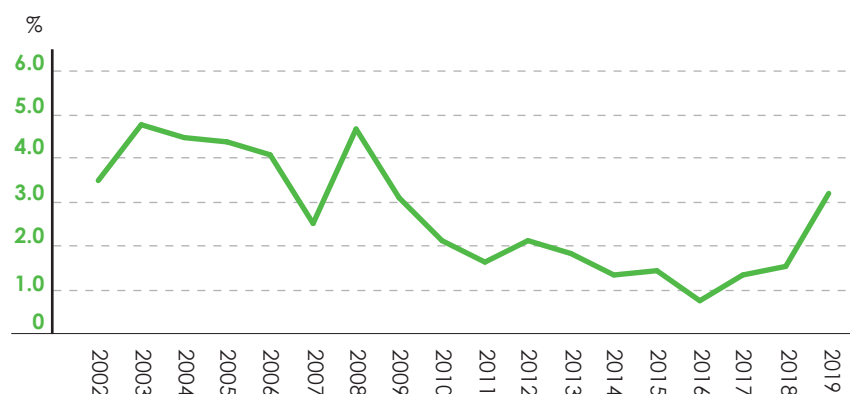
1   ABS Schools, Australia, 2019 released 6th February 2020 and available at https://www.abs.gov.au/ausstats/abs@.nsf/mf/4221.0
2   The sector growth in 2019 is higher than expected as a result of one independent school which was previously not funded by the Australian Government, being recognised in the Commonwealth Census for the first time in 2019. In 2019, this school enrolled 1,083 students. Total sector enrolments including this school in 2018 were 121,899. Including this school in the sector2018 enrolment data results in an enrolment growth rate of 2.4% from 2018 to 2019 which is in line with the enrolment growth recorded in the State Census of Schools held in February 2019.
3   The independent sector expects additional enrolments of around 1,500 students in 2020 as a result of the exiting of the Prep half cohort.

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Figure 2: Aboriginal and Torres Strait Islander Students – Queensland Independent Sector
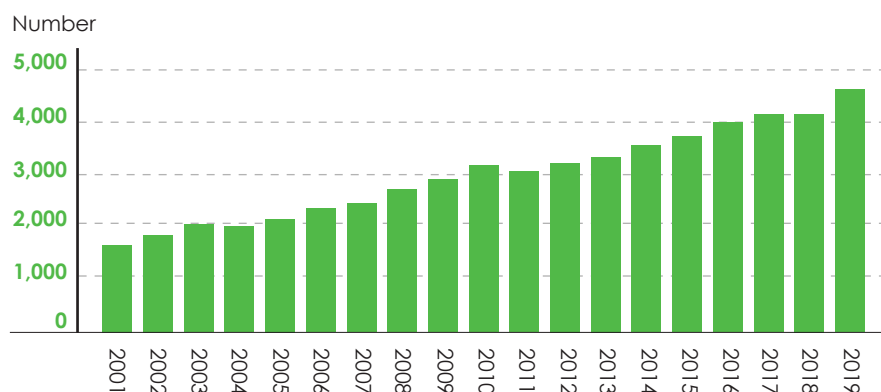
The 2019 enrolment data also reveals that the independent sector is becoming more diverse in Queensland catering for an increasing range and diversity of students and schools.

Thirty-two (32) new independent schools have commenced in Queensland since 2012 (at an average of around 4 new schools each year). Thirteen (13) of these new schools are Special or Special Assistance Schools, catering for students with disability and/or students disengaged from schooling. The number of students in independent Special and Special Assistance schools has rapidly grown in recent years to just under 5,000.

Some of the new independent schools are offering specialist provision such as industry-based programs and there are several new schools offering "alternative" programs to mainstream schooling driven by parental demand and local communities.

Also rapidly increasing is the number of Aboriginal and Torres Strait Islander (Indigenous) students enrolled in independent schools. Indigenous students numbered 4,575 in 2019 compared to about 3,000 a decade ago (see Figure 2).

There is also an increasing number of students with disability being catered for in the independent sector with 2019 verified students numbering 4,180[4]. This compares to around 1,500 students with disability in the sector a decade ago.

Diversity is also reflected in the Queensland independent sector by the significant number of distance education students enrolled in independent schools. Nearly 3,500 students undertake their education through full-time distance education through independent schools.

Boarding provision is another unique provision to the independent sector with 3,800 students boarding for their schooling at independent schools. Add to this the almost 2,000 full fee-paying overseas students in Queensland independent schools to complete a sector which is truly characterised by diversity, giving parents choice right across the state about the schooling provision that is in the best interests of their children.

A series of Independent Schools Queensland Snapshots outlining detailed information and trends on enrolments based on the 2019 Census is available at https://www.isq.qld.edu.au/advocacy-representation/sector-statistics.

Whilst the enrolment data from the 2019 Census is impressive evidence of the contribution the independent sector makes to schooling in Australia, there is a "forgotten" group of children described as a "hidden disaster"[5]. These are the estimated 50,000 children detached from formal education at any one time.

A report *"Those who disappear: The Australian education problem nobody wants to talk about"*[6] by Dr Jim Watterson (a former Director General of Queensland Education) and Megan O'Connell, concluded 50,000 was a conservative estimate of the number of unaccounted school-aged children who are completely disconnected from any form of education.

It recommends a national approach to the issue, led by the Australian Government including early intervention and boosted support for accessible education programs and alternative environments to mainstream schools.

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4   Based on February 2019 Census data.
5   From a Sydney Morning Herald article (author: Fergus Hunter) published 28/11/2019 based on research by the University of Melbourne's Graduate School Education.
6   Available at https://education.unimelb.edu.au/mgse-industry-reports/report-1-those-who-disappear

Some of the new independent schools are offering specialist provision such as industry-based programs and there are several new schools offering "alternative" programs to mainstream schooling driven by parental demand and local communities.

Queensland independent Special Assistance Schools do a wonderful job in catering for such disengaged students, but clearly existing provision is not adequate to meet the needs in terms of the number of students.

Estimates have been made of up to 15,000 Queensland school-aged children who are not enrolled in a formal schooling program.

This is an issue for which all educators must take responsibility and one where governments and schooling sectors must work together to ensure that every child receives a high standard of education.

DAVID ROBERTSON
Executive Director

Independent Schools Queensland

ARTIFICIAL INTELLIGENCE IN EDUCATION (AIEd)

MARK NEWHAM
Director
(School Improvement & Performance)

Co-author
KATE CROWE
Project Manager
(Educational Data & Naplan)

"The computer scientist John McCarthy coined the phrase 'Artificial Intelligence' in the 1950s to describe the science and engineering of enabling a computer system, software, program and robot to 'think' intelligently like humans. Advancements in AI have been driven by the expansion of the internet, availability of big data and more powerful computing and algorithms."

Holmes, Bialik, & Fadel, 2019

In education, we are only just starting to scratch the surface in realising what AI can do to enhance learning outcomes for students, teachers and school leaders. AI will also become an important part of any attempts to scale up effective practice.

What are the benefits for students and teachers?

Ohio State university professor Sidney Pressey saw the potential of a teaching machine to free teachers' time to engage with students rather than on marking assessment in the 1950s. "Devices which at once inform a student about the correctness of his answer to a question, and then lead him to the right answer clearly do more than test him; they also teach him" (Pressey, 1950).

AI provides opportunities to share best practice, improve the quality of teaching and increase access to learning materials. AI has the potential to provide disadvantaged students with opportunities to access targeted tuition that might otherwise have only been available as fee for service. This access for students also requires equity in access to the relevant technology.
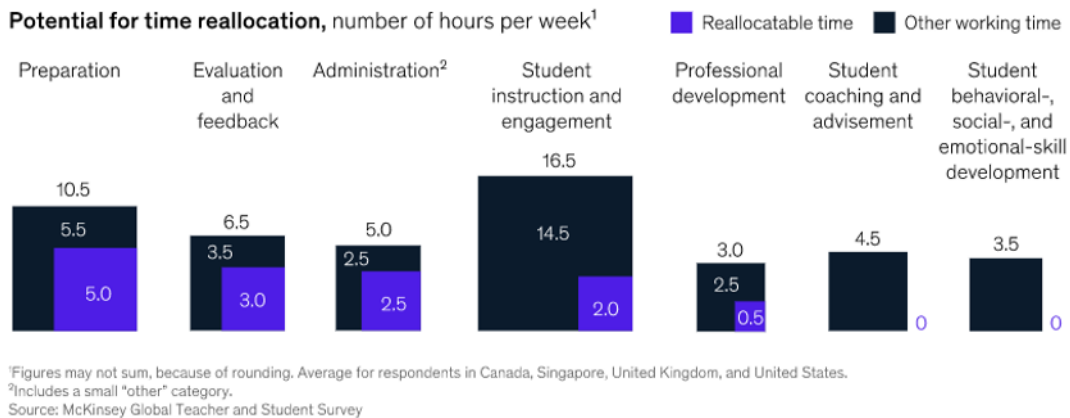
The development of AI national formative assessment tools is one way the Australian Government is working at improving access to this technology. The National Learning Progressions and Online Formative Assessment Initiative (LPOFAI) aims to address the finding of the Gonksi Review to Achieve Educational Excellence in Australian Schools that aligned, online and on-demand assessments, combined with professional learning and resources, will aid the use and interpretation of learning progressions in order to maximise the learning growth and attainment of every student every year (Education Services Australia, 2019). LPOFAI is in the discovery phase of a project to create a national formative assessment tool, recognising that, "the design of structured tasks takes significant time and skill, as does the analysis of results to make informed decisions. Online and on demand assessment resources aligned to learning progressions... would assist teachers to administer quality assessment quickly and easily to inform their professional judgement of a student's progress and confirm next learning steps" (Education Services Australia, 2019).

The initiative acknowledges that teachers already differentiate their teaching and learning programs to address the needs of their students. They routinely assess to monitor student learning and progress. But they find it challenging to provide timely, personalised feedback; identify relevant, high quality assessments and resources aligned to the Australian Curriculum; and decide the appropriate next steps for students at different levels of attainment. It is hoped that advances in Artificial Intelligence (AI) will enable these challenges to be addressed.

Figure 1: The benefits of increased time for teachers and their students

Technology can help teachers reallocate 20 to 30 percent of their time toward activities that support student learning.

Potential for time reallocation, number of hours per week[1]   ■ Reallocatable time   ■ Other working time

Preparation	Evaluation and feedback	Administration[2]	Student instruction and engagement	Professional development	Student coaching and advisement	Student behavioral-, social-, and emotional-skill development
10.5	6.5	5.0	16.5	3.0	4.5	3.5
5.5	3.5	2.5	14.5	2.5		
5.0	3.0	2.5	2.0	0.5	0	0

[1]Figures may not sum, because of rounding. Average for respondents in Canada, Singapore, United Kingdom, and United States.
[2]Includes a small "other" category.
Source: McKinsey Global Teacher and Student Survey

What do we mean by AI in education?

Educ-AI-tion Rebooted, exploring the future of artificial intelligence in schools and colleges (Baker, Smith, & Anissa, 2019) defines AI as "computers which perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving" and, similarly to Holmes et al, describes three categories of artificial intelligence in education:

- Learner-facing AIEd
- Teacher-facing AIEd
- System-facing AIEd

These three categories of artificial intelligence in education provide an opportunity to identify different strengths and opportunities in the provision and use of AI in education. Schools may choose to opt into some or all of these categories. Many already have.

Learner-facing AIEd

Learner-facing AIEd describes the software used by students to receive and understand new information. It best describes intelligent tutoring systems that are designed to deliver learning materials based on diagnosed student needs and provide automated feedback. Many school learning management systems are Learner-facing AIEd with varying levels of sophistication. Variation exists in teachers' skills and confidence in using Learner-facing AI. Individual schools' investment also varies significantly. Learner-facing AI has the capacity to be extended to inform next steps for teaching rather than a separate tool.

An example of this is ALEKS (Assessment and Learning in Knowledge Space), a popular online learning platform. Students complete an assessment to gauge their current knowledge and, based on their responses, ALEKS claims to gain a precise picture of the student's level of understanding. When the student enters Learning Mode, the system then uses their assessment adjust its curriculum to fill in their knowledge gaps.

Another example is Squirrel AI. Squirrel breaks down subjects into ten thousand knowledge points and it is claimed that this level of granularity enables the platform to identify any student misconceptions precisely (Kulkarni, 2019).

For a comparison, "a textbook might divide the same subject into 3,000 points; ALEKS, developed by US-based McGraw-Hill, which inspired Squirrel's, divides it into roughly 1,000" (Hao, 2019).

Teacher-facing AIEd

Teacher-facing AIEd refers to the ways AI can be used to assist teachers to design and deliver learning to students. Examples of this include automated marking, feedback, administrative tasks, insights into student progress. Well designed AI may also help teachers to innovate and experiment, delivering content to different students based on shared characteristics. Many teachers and independent schools are already using Teacher-facing AI to support the ways they design and deliver learning to students, expanding on learner facing AI by engaging in analytics add-ons of learning management and school management systems such as TrackOne, Microsoft Power BI, Schoolbox or applications such as MAP Growth.

Research by McKinsey & Co (Bryant, Heitz, Sanghvi, & Wagle, 2020) supports the notion that teachers are aware of the potential benefits that increased time can provide them and their students. (See Figure 1.)

Their research found that 20 to 40 percent of teacher hours are spent on activities that could be

ARTIFICIAL INTELLIGENCE IN EDUCATION (AIEd) CONTINUED

automated using existing technology. That extra thirteen hours a week can then be available for improved student learning.

It also found that the areas with the biggest potential for automation are preparation, administration, evaluation, and feedback. Interestingly, regarding feedback, it might be assumed that teachers already do this effectively and increased time would only increase this effectiveness. However the research (Bryant, Heitz, Sanghvi, & Wagle, 2020) found that even when teachers believed that they were already providing personalised feedback, students disagreed. Sixty percent of the teachers surveyed believed that their feedback was personalised to each student, while only 44 percent of the students surveyed felt the same way. Therefore, any increase in time provided by automation would still need to involve high-quality professional learning for the increased time to be worthwhile.

To assist with school's heavy administrative burdens, options might include the use of chatbots (Rouse, 2018) that can answer commonly asked questions about the school. In a similar vein, "Deakin University is using IBM Watson to [enable students] to ask questions about administrative and course information in natural language,

in place of searching through keyword-based FAQs" (Henebery, 2019b, para. 14).

System-facing AIEd

System-facing AIEd helps make or inform decisions made by those managing and administrating schools or our education system as a whole. In Australia, this includes the use of data from the National Assessment Program and other demographic data about students to inform state and national policies. State education systems are better able to use internal assessment data as part of their algorithms as data is captured for the sector as a whole. The autonomy of the independent sector and the varied school management and learning management systems makes this a more complex process. This area is largely in its infancy and relies heavily on summative assessment and survey data.

What could it look like in schools?

Schools need to provide the tools, time and training first and then, with well-developed strategies, they can plan for the use of AI. This could unlock opportunities to automate a number of tasks including marking, freeing teacher time to focus teaching and

learning. Teachers could incorporate intelligent tutoring systems into lessons to small groups of targeted students, providing personalised learning for all students for part of every lesson.

AI provides opportunities for teachers to gain deeper insights into what is working well in their teaching and identify the different ways students approach problems in their working.

Data in schools is often collected summatively and used to identify where a student achieved at the end of a unit or year in order to report. To be most effective, data needs to be gathered in ways that enable teachers to answer the 'now what?' How do we address the gaps in learning? AI could be useful in assisting with more frequent, low stakes, formative assessment that identifies the 'what next' for students and supports teachers to implement it.

Catherine Devine, Microsoft's Business Strategy Lead, Libraries and Museums states that "[a]s a transformative technology every school should leverage [AI] to improve education outcomes, and every student should be aware that it will be a fundamental skill for the future... AI allows for the personalisation of the education experience, ultimately improving educational outcomes for students, as opposed to one approach for all students" (as quoted in Henebery, 2019a, para 7). Furthermore, "Devine said that for libraries, AI will be 'pivotal in expanding discoverability of content'" (Henebery, 2019a, para. 10).

Parents surveyed in the UK (Baker, Smith, & Anissa, 2019) felt *fairly happy* or *very happy* for AI to be used for school timetabling, completing teacher's administrative tasks and adjusting the pace of a student's progress based on the speed of learning. There was less comfort about automated marking. This is replicated in Australia with automated essay marking of the NAPLAN writing task.

Schools need to provide the tools, time and training first and then, with well-developed strategies, they can plan for the use of AI.

Research undertaken by ACARA in 2018 identified that the automated scoring system provided the same level of reliability and consistency as that found between two sets of human markers (Lazendic, Justus, & Rabinowitz, 2018). Coined 'robo-marking' in the media, this approach has attracted criticism from teachers who question the ability of AI to properly assess more complex skills such as creativity, irony and other features of writing.

Although AIEd is often seen as seeking to replace teachers (and some CEOs of technology companies are quite open about this aim), our research suggests that this is neither possible (in the foreseeable future) nor desirable. Instead, as Rose Luckin and colleagues note, "[i]t is teachers who will be the orchestrators of when and how to use AIEd tools" (Luckin, Holmes, Griffiths, & Forcier, 2016).

What do schools need to make it successful?

The Australian Government Department of Education research report, *Artificial Intelligence and emerging technologies in schools* found:

- *AI in school education is still in the early stages of development. Educators need to develop foundational knowledge of learning about and with AI in order to empower students to thrive in an AI world*
- *Learning about and with AI will require teachers to understand the economic and social changes that the technology will bring as well as its potential educational uses and ethical considerations*
- *There is much work to be done around the ethical, legal and governance frameworks to ensure that AI technology is used for good, and that transparent processes are in place to*

endure accountability at classroom, school community and school system levels.
Equitable access to technologies that support AI is crucial to ensure that all students realise the potential benefits (Southgate, et al., 2018).

"AI in educational institutions is no different to other sectors. With new and emerging technologies like AI, we must ensure we carefully design trials/tests to evaluate the result against key objectives and identify the rules and regulations surrounding the implementation of these technologies." Dr Fang Chen (Henebery, 2019a, para. 18).

School data will need to interact with deidentified data from students in other schools to enable computers to learn about student learning and apply it to more sophisticated algorithms. This is only possible from large data sets.

It isn't enough to provide shiny new systems and expect changes in student outcomes or teacher engagement with the tools. Careful consideration about the tools to be used, how they interact with one another and how they enhance teaching and learning are critical to their success in schools. Teachers need support to understand the capability of AI and the practical application of tools to be integrated into their planning.

In planning for successful implementation, data governance is key. Students need to be able to be uniquely identifiable within a school to automate the matching of differing sets of data. Schools need to strike a careful balance. Over management creates too much additional work for teachers, becoming an exercise in data gathering rather than in using data to inform teaching. Undermanagement renders the data useless and/or too cumbersome to use effectively.

Schools need the infrastructure to effectively support the use of AI in education. Given the autonomy of the independent sector, independent schools must consider their individual needs and then identify and fund appropriate AI solutions.

At the graduate career stage, the following Australian Professional Standards for Teachers are relevant to AI and the supporting technologies.

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.

2.3 Curriculum, assessment and reporting: Use curriculum, assessment and reporting knowledge to design learning sequences and lesson plans.

2.6 Information and Communication technology: implement teaching strategies for using ICT to expand curriculum learning opportunities for students.

3.3 Use teaching strategies: Include a range of teaching strategies

3.4 Select and use resources: Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning.

3.6 Evaluate and improve teaching program: Demonstrate broad knowledge of strategies that can be used to evaluate teaching programs to improve teaching and learning.

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

5.1 Assess student learning: Demonstrate understanding of assessment strategies, including informal and formal, diagnostic, formative and summative approaches to assess student learning.

5.4 Interpret student data: Demonstrate the capacity to interpret student assessment data to evaluate student learning and modify teaching practice.

ARTIFICIAL INTELLIGENCE IN EDUCATION (AIEd) CONTINUED

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