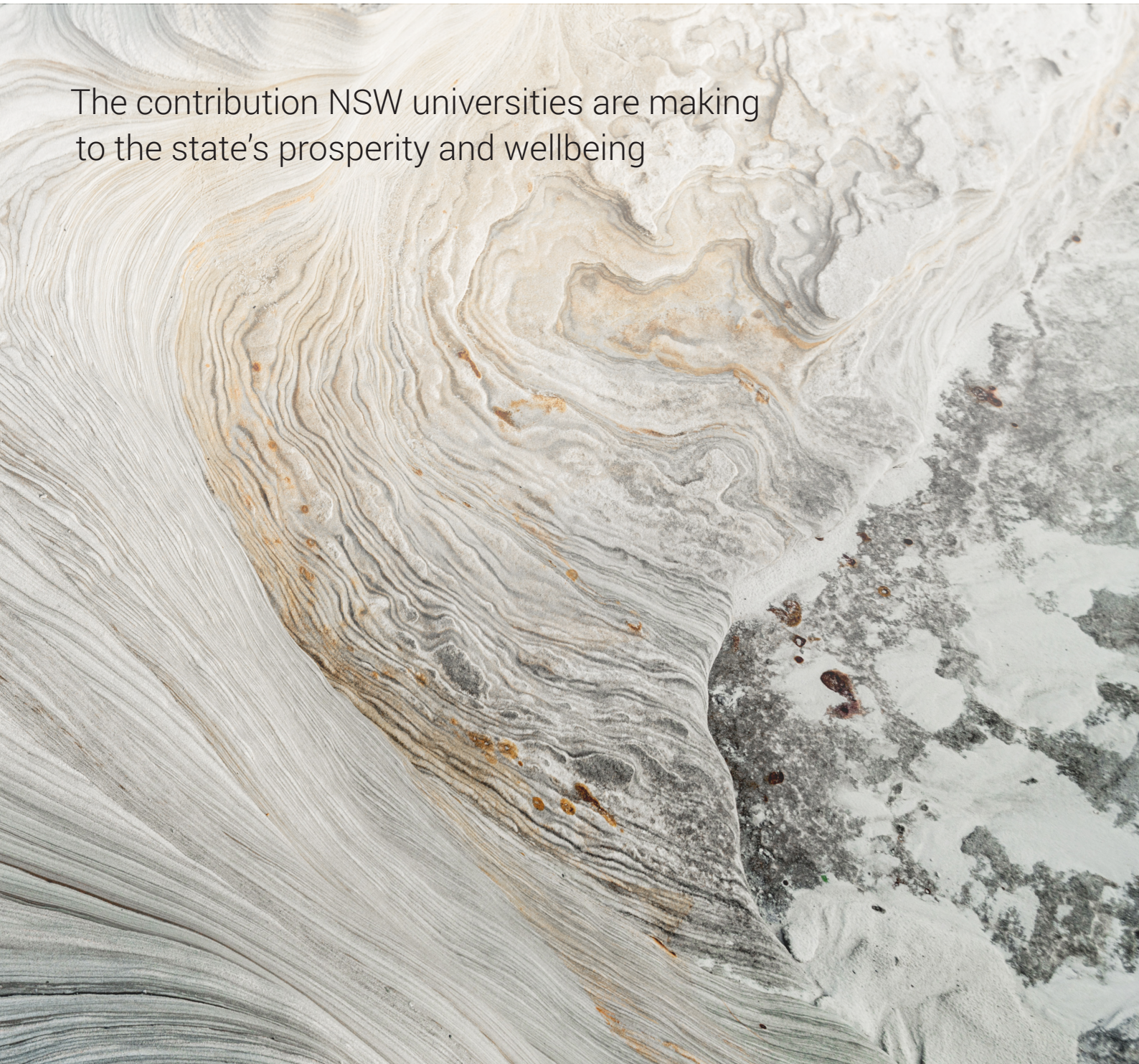

Research Impact NSW

The contribution NSW universities are making
to the state's prosperity and wellbeing



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UNIVERSITY
OF WOLLONGONG
AUSTRALIA

WESTERN SYDNEY
UNIVERSITY



Introduction



Duncan Ivison

Chair, NSW Deputy & Pro Vice-Chancellors'
(Research) Committee

New South Wales has 11 public universities who combine a commitment to academic excellence with a passion for translating their research into economic, social, environmental and cultural benefits for the state, Australia and the world.

Universities are also a vital part of the economic fabric of the state. In 2018, international education was NSW's second largest export (behind coal) and the state's largest services export. It was worth \$13 billion and supported 95,000 jobs in NSW.

The aim of this publication is to highlight the extraordinary contribution our universities and their partners are making to the prosperity and well-being of NSW. It demonstrates the many and varied ways in which universities, in partnership with their local communities, industries and state and local governments, are turning good ideas into real-world benefits. In highlighting these partnerships, we also want to encourage even more engagement and collaboration between researchers, policy makers and businesses – there is so much more we can do together.

Research can be an engine for innovation and growth. It is also capable of inspiring us by looking over the horizon to investigate the unknown and to find unexpected solutions to intractable problems.

In highlighting these partnerships, we also want to encourage even more engagement and collaboration between researchers, policy makers and businesses – there is so much more we can do together.

Public policy and research tend to work to different timetables. Meticulous gathering of data, analysis of evidence, writing and disseminating findings does not always dovetail with the political cycle. However, through collaboration with policy makers, service providers and businesses it is possible to generate outstanding, mutually beneficial outcomes. Sustained relationships help to identify priorities for R&D and can provide exciting research opportunities within industry and the community. Working together also fosters better understanding of the long-term nature of the research process, the time constraints imposed on policy development and the frequent need in the workplace for just-in-time solutions.

Publicly funded research is conducted under the umbrella of national and other priorities; it also emerges from the process of inquiry itself, which builds on existing knowledge and asks big questions. Some of the research presented here demonstrates the outstanding intellectual resources New South Wales can draw on to lead the way in new industries and new ways of doing business; other examples show how research contributes to implementing innovative public policy and programs. All demonstrate the ways in which our research can have impact beyond the academic world and how it engages with industry and the community.

The case studies in this publication range across a diversity of fields and methodologies. Many tackle cross-cutting problems, drawing together different disciplines and approaches. For example, an educational intervention can also improve mental health and reduce social disadvantage. So, while we have chosen priorities identified by the NSW Government as an organising principle for what follows, readers will see that the boundaries between these priorities are porous and thus helps demonstrate how interconnected they are.

Each case study demonstrates why research matters: not only because it changes and improves lives, but because it deepens human understanding of the world around us and of our fellow human beings.

The economy

The NSW economy is the powerhouse of Australia and a standout by global standards.

– Gladys Berejiklian, 2018

New South Wales is Australia's largest state economy, accounting for around a third of the nation's economic output. It is home to nearly a third of Australians, nearly 8 million people. The economy includes industries such as financial services, professional, scientific and technical services, property services, information media and telecommunications. The construction, manufacturing, health and education sectors also account for large shares of economic activity. All these are benefiting from the research NSW universities conduct, especially when this research shows the way into cutting-edge technologies and new industries. In recent years, this strong research culture has turned Sydney into Australia's start-up capital, where 64 per cent of all Australian tech start-ups are launched.

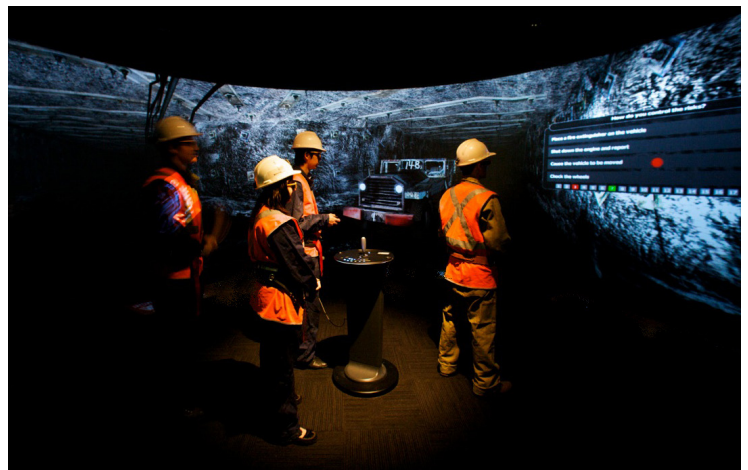
From the creative arts to mine safety

Innovation is a driver of productivity. It stems from creative minds willing to take risks and to cross boundaries. This is what the Centre for Interactive Cinema Research (iCinema) at UNSW Sydney. The centre spans the Faculties of Art & Design, Arts & Social Sciences, Engineering and Science and the National Institute of Dramatic Arts. This interdisciplinary effort has resulted in a 360-degree 3D mobile cinematic platform called AVIE3.

AVIE3 integrates research in experimental art and artificial intelligence and enables immersive modelling of fictional and real-world scenarios in real-time at 1:1 scale. The platform has wide-ranging uses. It has helped preserve a fragile heritage site – a Tang Dynasty Buddhist grotto in one of the Mogao Caves (Dunhuang, China) – by means of digital reproduction so that visitors can experience the site without causing physical damage. In a project with the Department of Veterans Affairs, AVIE3 captured the experiences of Afghanistan veterans, their families and the wider community in a way that personalised stories of war.

And, in an industrial setting, it has delivered realistic 3D models of an underground mine in which up to 30 trainees at a time can explore hazard and technology scenarios in virtual reality. The university developed this application in collaboration with the Shenyang Research Institute of China Coal Technology & Engineering Group, Fushun, China's leading research and training institute for coal mine safety.

AVIE3's 3D underground mine models enable trainees to safely explore different scenarios in virtual reality.



From nanoscience to commercial waste management

The University of Sydney's professor of chemistry, Thomas Maschmeyer, has applied fundamental chemical processes to develop ways to convert waste into biofuels and to create a battery that can store renewable energy. These inventions address the dual challenges of climate change and limited natural resources. They are also commercially viable.

Nature takes millions of years to create fossil oil; the Catalytic Hydrothermal Reactor (Cat-HTR™) converts waste into renewable fuels and chemicals in 20 to 30 minutes. This catalytic process can also split pollution-heavy brown coal into more energy-efficient black coal and oil. In 2007, the company Licella was established to commercialise Cat-HTR™. By 2016 the technology was the world's most commercially advanced hydrothermal upgrading platform. Licella went on to form iQRenew to deploy the Cat-HTR™ to convert plastics that otherwise go to landfill into fuels and chemicals. iQRenew operates on the east coast of Australia, servicing for example the NSW Central Coast Council area's garbage collection and recycling.

The application of nanotechnology to zinc-bromide batteries has enabled the manufacture of a cheaper, safer and more durable batteries, which can store renewable energy in innovative ways, including within the walls of buildings. The University of Sydney's Nano Institute used this discovery to create its first spin-off company, Gelion Technologies, which attracted over \$21 million in start-up capital in 2016 and now has 26 employees in NSW.



Professor Thomas Maschmeyer, 2018 Eureka Prize Winner, Leadership in Innovation and Science, and inaugural director of the Sydney Nano Institute.

From used tyres to green steel

'Green steel' technology invented at UNSW Sydney has prevented millions of waste rubber tyres ending up in landfill. Instead the tyres are burned at super-high temperatures in furnaces used to make steel. Professor Veena Sahajwalla, director of the UNSW Sydney's Centre for Sustainable Materials Research and Technology, worked with OneSteel to pilot this polymer injection technology (PIT) and then to commercialise and licence 'green steel'.

PIT precisely calibrates the optimum blend of granulated carbon-based waste in the furnaces, thus absorbing the waste while also improving furnace efficiency and reducing electricity usage. The incorporation of PIT into OneSteel's commercial furnaces reduced production costs by 15–35 per cent. OneSteel's successor, Arrium, signed a global licensing deal with UNSW Sydney for PIT and proved its commercial viability at furnaces in Laverton, west of Melbourne, and Rooty Hill in Sydney's west. The current owner, the Gupta Family Group Alliance, is planning to expand production of green steel beyond 1.5 million tonnes a year.

In 2019 Professor Sahajwalla was appointed inaugural co-director of the Circular Economy Innovation Network, in which the NSW Government has invested \$1.5 million. Executive Director of the Warren Centre at the University of Sydney, Ashley Brinson, is the other director. The Warren Centre brings industry, government and academia together to create thought leadership in engineering, technology, and innovation.

"The establishment of this Network will significantly benefit NSW. Economically, annual exports of NSW environmental goods and services are already worth \$3 billion. This is an exciting opportunity to build on our strong research and industry strengths to enhance our state's current position as a market leader in the Asia-Pacific."

– NSW Innovation and Productivity Council Chair, Neville Stevens AO

From genetics to farm profitability

The University of New England's Animal Genetics Breeding Unit (AGBU) supports agricultural industries by identifying the best animals and plants to breed for commercial purposes. AGBU was co-founded in 1976 by the NSW Department of Primary Industries and the University of New England. Today, it provides world-leading genetics research and development services to several livestock industries including beef, sheep (both meat and wool) and pork and, since 2000, the forestry sector.

By combining large industry datasets with genetic analysis, AGBU has developed leading genetic evaluation software applicable to a range of sectors including beef, sheep and trees. In Australia, gross benefits from AGBU's beef and sheep genetics R&D are estimated at \$1.4 billion, which adds an extra \$45 million to \$50 million of on-farm wealth each year by increasing the value of agricultural outputs, while reducing their input costs.

"AGBU's longstanding partnership with the red meat and livestock industry... has supported the development of genetic evaluation systems that are the envy of the world. AGBU's delivery of R&D benefits the entire supply chain. It ensures industry investment remains relevant and that we retain our competitive advantage..."

– Former managing director of Meat and Livestock Australia, Richard Norton

From biotoxin research to seafood safety

Getting early warning of the potential for contamination of shellfish protects both consumers and Australia's multi-million-dollar seafood and aquaculture industries. The University Technology Sydney (UTS) Seafood Safety Program has developed tools that can predict harmful algal blooms up to two weeks before they eventuate. This work has been commercialised by a Sydney-based molecular diagnostics company, and is now being used by a shellfish aquaculture farm, researchers and other bodies in Australia and internationally.

The tools are based on data collected by Hornsby Shire Council, which has monitored algal populations within the Hawkesbury River since 1995. The collaboration with UTS scientists resulted in Algalert, a website that provides information on how to respond to harmful algal blooms in NSW. This tool has been used by other councils and won the NSW Annual Coastal Management Innovation Award in 2016.

UTS' research into biotoxins in fish has led to the creation of NSW's first testing facility for ciguatera fish poisoning and has changed the seafood handling guidelines at the Sydney Fish Market, Australia's largest centre for fish distribution.

By developing new ways to monitor biotoxins in shellfish and to better understand the evolution and ecology of biotoxin production, the science has helped to make the cost of testing shellfish up to 2.7 times cheaper in NSW with the potential to save the NSW shellfish aquaculture more than \$140,000 a year.



Associate Professor Shauna Murray, leader of the Seafood Safety research program and an independent technical representative on the NSW Food Authority.

Health and wellbeing

The NSW government and higher education sector work together to achieve better health for the people of NSW.

Collaboration with the Office for Health and Medical Research is helping to translate research into innovative policy and practice. Another initiative is the Sydney Health Partnership between Sydney, Northern Sydney and Western Sydney Local Health Districts; the Sydney Children's Hospital Network (at Westmead), the University of Sydney and nine independent medical research institutes. This partnership is removing or reducing barriers to the effective use of health and medical research into clinical practice. It cares for 2.7 million people across NSW. Maridulu Budyari Gumal, meaning 'working together for good health and wellbeing', unites 14 organisations that are striving to accelerate life-changing research, reduce healthcare costs and inspire the next generation of health professionals.

Outside Sydney, the University Centre for Rural Health – North Coast (UCRH) partnership works on education, clinical delivery and research. Its members are the Northern NSW Local Health District, Commonwealth Department of Health, and universities of Wollongong, Western Sydney and Southern Cross.

Caring for patients with motor neuron disease

The co-location at Macquarie University of clinical services and Australia's largest concentration of motor neuron disease (MND) researchers provides MND patients with bespoke care, while supporting a translational research platform that has made important discoveries about the genetic origins of familial MND. Using tissue and genetic samples donated by patients and their families to Macquarie's MND Biobank researchers have identified some of the genes involved in the disease. Using in-vitro fertilisation, three babies have been born with these faulty genes removed. These genetic discoveries have been incorporated into standard diagnostic testing of MND patients worldwide.

The MND out-patient clinic offers multidisciplinary care where, in a single session, the patient has access to a team of MND-specific medical experts who deliver integrated healthcare in one location. Costs outside those eligible for rebates are covered by donations to Macquarie University. With a financial gap of approximately \$400,000 per year, this is having a significant and highly appreciated impact for patients.

As the disease progresses, MND patients might be hospitalised. They can then receive fully integrated clinical care at Macquarie University Hospital, which has specialist MND nurses directly guided by the consulting MND neurologist, who can regularly check on patients because of physical proximity.



The Motor Neuron Disease Research Centre takes an integrated approach aimed at making MND history.

Improving children's emotional health

Macquarie University's Cool Kids suite of programs has improved the mental health of tens of thousands of children around the globe. It was the first-ever anxiety program to be delivered in a distance format: first via telephone, then CD-Rom and since 2016 online.

The researchers developed structured, skills-based psychological therapy programs to teach children, adolescents and parents how to treat anxiety. The children who go through the programs show improved quality of life with reduced rates of anxiety and depression that are sustained.

In consultation with the NSW Education Standards Authority, the developers of the Cool Kids suite informed the 2018 disability provisions for anxious and depressed students requesting special arrangements for the Higher School Certificate. More widely, public mental health services are using the Cool Kids suite to implement internet therapy, group-based therapy and stepped-care therapy for child anxiety. The clinics are subsidised through Medicare, with Rotary Australia grants-in-aid available for disadvantaged families.

Cool Kids is part of the training of intern psychologists from the universities of Wollongong, Newcastle, Western Sydney, Tasmania and Canberra, and from the Australian College of Applied Psychology. Around 1500 Australian clinicians and schoolteachers have completed training in the Cool Kids suite.



Tens of thousands of children have received mental health care through the Cool Kids programs, including through private clinics, public services and schools that use Cool Kids resources and therapy manuals.

Image courtesy of the Centre for Emotional Health.

Engaging fathers in obesity prevention

The University of Newcastle program Healthy Dads Healthy Kids (HDHK) has received global recognition for excellence in promoting health and well-being in the community. Knowing that obesity in fathers is associated with a four-fold increase in the risk of obesity for both sons and daughters at 18 years of age, the world-first program engaged fathers to themselves achieve a healthy weight as well as improve the activity and eating behaviours of their children. Making physical activity fun, and part of father-child interaction, was key to the project.

The researchers conducted two randomised controlled trials of the program through a partnership between the University of Newcastle, Rio Tinto's Coal & Allied and the Hunter Medical Research Institute. Fathers in the trial groups achieved a significant and clinically meaningful weight loss compared to the control group, which registered little change. The program was conducted in communities with a high proportion of blue-collar shift workers in the mining sector.

The researchers trained community members to serve as program managers and facilitators and local schools provided facilities and equipment. By 2016, HDHK had transitioned from a university-led program to a community-managed initiative with adaptations implemented in England, Scotland and the USA.

"I cannot recommend this program enough. It has probably added years to my life expectancy... more importantly, it has added immeasurably to my quality of life and my family's."

– HDHK father



Families participating in the international award-winning Healthy Dads Healthy Kids program developed by Professor Phil Morgan.

Treating youth mental illness

The University of Sydney's Brain and Mind Centre focuses on multidisciplinary models of mental health care, which bring together patients with neurologists, psychiatrists, psychologists and brain scientists, without the usual discipline-based academic and professional silos. Its work concentrates on children and young people, where early intervention can have large economic and social benefits over the long term.

The centre partners with researchers, primary health care providers, non-governmental organisations, local health districts, government and industry. Its evidence-based patient care has attracted extensive support from the Australian NSW governments.

Innovative technologies now offer consumers and their families, as well as health professionals and service providers, new ways to access better mental health care. These data-driven technologies use consumer-entered health information to determine holistic treatments. This real-time information is multi-dimensional and considers additional disorders, as well as developmental pathways and illness trajectories.

For someone with clinical depression, suicidal thoughts or behaviours, being placed on a wait list to get professional help is not good enough. Now, thanks the InnoWell Platform, consumers can get faster access to mental health care via an online tool that includes protocols for identifying and notifying at-risk users and then guides them to get the care they need, when they need it most. The InnoWell Platform can also improve access for people in more remote places, for example by facilitating 'video visits' to a health professional.



Professor Ian Hickie, Co-Director, Health and Policy, at the Brain and Mind Centre, which has a priority to use new health information technologies to reach individuals across the lifespan, including those living in regional, rural and remote areas where mental health services are limited.

Education

NSW has adopted technology as part of the curriculum in its schools. The government recognises that students live in a rapidly changing technological world, where information and communication technology (ICT) are important part of everyday life and that the integration of ICT capabilities into teaching, learning and assessment in NSW syllabuses can lead to enhanced outcomes for students. Research is showing how to best deploy technologies to meet the goals of improving academic results and helping disadvantaged learners. This, in turn, contributes to NSW government priorities such as improving the literacy and numeracy of public-school students.

Improving literacy and numeracy

Gaps in performance between educationally disadvantaged students and their peers widen from Year 3 to Year 5 and on to Year 7 and Year 9. Students who by Year 4 show consistent weaknesses in basic skills find achieving sustainable progress difficult in the usual classroom school environment. This can lead to ongoing economic and social disadvantage. The University of New England's Quicksmart program addresses the literacy and numeracy needs of these students.

QuickSmart is an individually focused intervention over 30 weeks to help persistently low-achieving middle-school students improve their understanding and recall of basic academic facts. The program offers professional learning and support for teachers, so that they can work with a group of two students using a specially constructed teaching program supported by extensive material and computer-based resources.

The data collected from over 25,000 QuickSmart students show a narrowing of the achievement gap between QuickSmart and comparison students. Instruction builds on students' pre-existing knowledge in order to encourage their self-belief through successful learning experiences. This approach is very suited to enhancing the learning of many Indigenous students. Further benefits flow from recruiting Indigenous teacher assistants as instructors. Evidence from the program shows cognitive growth of up to two years for Indigenous students participating in the 30-week program.

Enhancing teaching and learning with technology

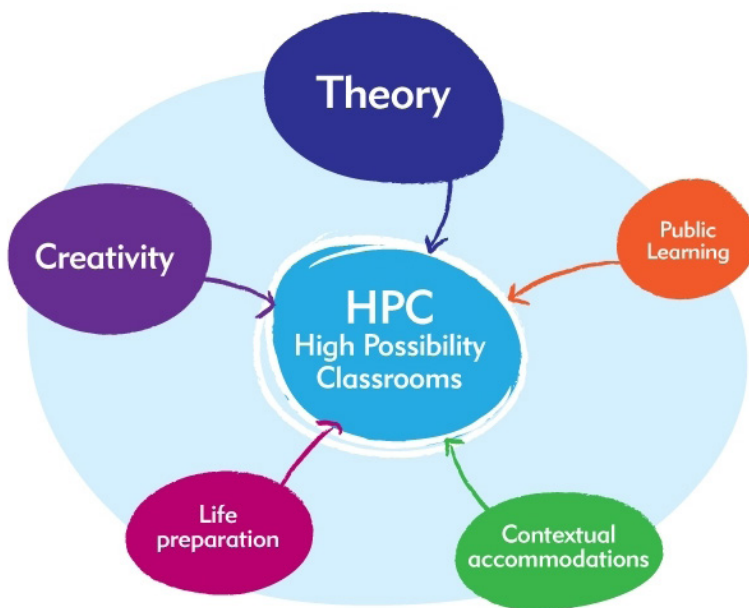
The major impacts of technology-enhanced learning (TEL) research at University Technology Sydney (UTS) arose from two innovative, evidence-based pedagogical frameworks designed to enhance the use of digital technologies in school education. The first, High Possibility Classrooms (HPC) builds teacher capacity and confidence in TEL; the second, iPAC, is a pedagogical framework for the use of mobile devices in teaching and learning. The HPC model does not just look at the technology used in schools, but how teaching practice and rich subject matter, can be enhanced and reimagined through varied uses of technology or sometimes no technology to engage students in their learning.

Both frameworks have significantly increased teachers' interest, competence and confidence in using technology in the classroom. The NSW Education Standards Authority has accredited four professional development programs on HPC and iPAC, embedding the frameworks into professional development for over 1200 primary and secondary teachers as well as schools' executive teams.

iPAC has been used to train teachers working in remote Aboriginal and Torres Strait Islander communities, as well as in the United Kingdom and Europe. Nine schools in Sydney have integrated the frameworks, which have enhanced the students' creative and critical thinking, improved writing skills and highlighted the relevance of STEM subjects and encouraged collaborative learning.

"The change in my students' learning as well as the change in the way I teach is a true testament to the power of [the framework]."

– Kieran Aggett Belmore South Public School



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Breaking the cycle of disadvantage

We are not here to avoid the toughest problems or simply to mark time – we are here to make a real and lasting difference.

– Premier Gladys Berejiklian and Deputy Premier John Barilaro

Intergenerational disadvantage occurs when challenging circumstances confront an individual, family or community from one generation to the next. The challenges people face stem from poverty, mental illness, poor education, low employment, social isolation, drugs and alcohol, trauma, troubles with the law and family violence. Qualitative and quantitative evidence from across the disciplines of humanities, economics and social science not only helps to define the problem but is also one ingredient in finding solutions to longstanding public policy problems. The research process itself can start to bring benefits to participants' lives or inform the design and delivery of interventions to help ameliorate social disadvantage.

Coping with loss and trauma

Seasons for Growth (SfG) developed by Professor Anne Graham at Southern Cross University is an innovative education program about the experience of grief. The program promotes resilience and self-esteem, normalises grief, builds peer support and fosters positive coping strategies, all factors that can reduce the risk of falling into a cycle of disadvantage caused by trauma.

SfG has given thousands of children, young people and adults a new start. The program has been adapted to support refugee children, young people in suicide 'hotspots', children involved in natural disasters (Stormbirds), as well as for Indigenous people (Seasons for Healing), prisoners (which required adaptations for limited learning resources), and parents of children in the program. The Parent Program is significant because parenting capacity is often impaired following major change and loss in families.

Twenty-seven per cent of programs are now run through community agencies. The program is offered in several NSW prisons and correctional facilities: Junee, Cessnock, Emu Plains, Glenn Innes and Silverwater. Prisoners find the sessions highly beneficial because they enable them to sort through, understand and accept their emotions, and learn techniques to handle these in a constructive way.



In 2005 Professor Anne Graham gifted her intellectual property to the non-profit organisation Good Grief Ltd, which administers SfG programs across Australia and coordinates mandatory training.

"My life has got worse but what Seasons for Growth has done is help me come to terms with it all. I cope a lot better. No matter how bad things get, I now have somebody I trust to talk to."

– Emma, 16

Giving the marginalised a voice

The Writing & Society Research Centre (WSRC) at Western Sydney University is nurturing the voice of Sydney's western suburbs, home to 1.6 million people and Australia's most culturally and linguistically diverse region.

What is now a writers movement started in workshops sponsored by WSRC in 2007. Four participants went on to win critical acclaim and awards. In 2013 Dr Felicity Castagna's *The Incredible Here and Now*, set in Parramatta, won the Prime Minister's Literary Award for Young Adult Fiction and Luke Carman's *An Elegant Young Man*, set in Liverpool, Penrith and Granville won the NSW Premier's Award for New Writing. In 2014 Dr Michael Mohammad Ahmad's *The Tribe*, set in a Lebanese community in Auburn, won a SMH Best Young Novelist Award. In 2015 Dr Fiona Wright's autobiographical essays set in Sydney's west, *Small Acts of Disappearance*, won the Nita B. Kibble Literary Award for Women's Life-Writing and the Queensland Literary Non-Fiction Award. These works have been adopted onto secondary and tertiary syllabi and reading lists.

The workshops morphed into Sweatshop: the Western Sydney Literacy Movement (led by Ahmad and supported by WSRC). Since 2012, Sweatshop has been devoted to empowering groups and individuals from culturally and linguistically diverse backgrounds through training and employment in creative and critical writing initiatives.



Dr Michael Mohammed Ahmad, winner of 2019 NSW Premier's Multicultural literary award for his novel *The Lebs*.

Environment

The NSW's climate change strategy aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate. The Government also wants its agencies to provide leadership in resource productivity and to focus on the challenges posed by rising costs for energy, water, clean air and waste management. Many of the universities' most impactful projects are in the area of the environment. The following case studies show how the combined activities of researchers and the community are addressing threats to the state's waterways and bushland.

Monitoring water resources

Effective management of Australia's water resources has multiple benefits but requires water managers to balance the water demands of industry and communities against their obligations to maintain the environmental and cultural values of rivers and floodplains.

Environmental flows research conducted by Charles Sturt University's Institute for Land, Water and Society has built an understanding of the links between different components of the ecosystem in the river environment. This knowledge has been used to underpin decisions about the duration and magnitude of environmental water releases in the Murray-Darling Basin. It has also helped to improve water quality and save native fish during periods of low oxygen and has increased populations of vulnerable Southern Bell Frogs.

Much of this work is conducted with other organisations. Since 2014, Charles Sturt University has been the leader of consortia undertaking a long-term (2014-2019) intervention monitoring (LTIM) project for the Edward-Wakool river system in the Murray-Darling Basin and another in selected areas of the Murrumbidgee River system. Among its partners are other universities, NSW Department of Primary Industries (Fisheries) and NSW Office of Environment and Heritage as well as local organisations. These long-term partnerships help to achieve practical on-ground solutions to complex environmental problems, including declining water quality and loss of aquatic animals.

The Murrumbidgee provides critical habitats for a number of federally-listed endangered species including the Southern Bell Frog.



Avoiding water pollution



"My advice for other academics is to grab any opportunity to connect with a decision maker, to ensure your research doesn't stay in the lab but instead is used to help benefit the community."

– Dr Ian Wright, Western Sydney University

In 2012, bushwalkers noticed unnatural flow and discolouration in the Wollangambe River, which flows through the Wollemi National Park and Greater Blue Mountains World Heritage Area. They contacted Dr Ian Wright at Western Sydney University (WSU), who traced the pollution to the Clarence Colliery and went on to demonstrate that contaminated groundwater was causing substantial ecological damage. By alerting the NSW Environmental Protection Agency (EPA) and the NSW Department of Industry, Dr Wright set in train more stringent regulation of mining in the area.

Both regulators resolved to avoid similar environmental legacies in the future. So, when the Berrima Colliery, near the Warragamba Dam, Sydney's main water supply catchment, was due to shut down in 2013, the EPA invited WSU to investigate and advise on the closure process. The researchers reported that concentrations of metals in the groundwater were entering the Wingecarribee River which supplies Warragamba Dam. The evidence of water pollution and ineffectiveness of environmental regulations led the NSW EPA to introduce stringent licence conditions for mines, prompting mine owners to upgrade their wastewater treatment technologies and practices. Subsequent testing has showed that the water quality and ecological health of several aquatic systems recovered.

Managing bush fires

Only effective fire management can address the delicate balance between mitigating risk to human life and property while concurrently mitigating the risk to biodiversity, air quality and carbon stocks. Bushfire research by the Centre for Environmental Risk Management of Bushfires (CERMB) at the University of Wollongong (UOW) has provided the knowledge and capacity to help resolve the complex trade-offs required to meet this immense challenge. Research findings have been incorporated into fire management strategies in NSW and Victoria in order to provide better protection for property and ecosystems. They have also been fundamental to improved decision-making by fire agencies in Australia and overseas.

CERMB led by Professor Ross Bradstock has long-term partnerships with state, federal and international agencies, which have been influential at the ecological, environmental, economic and community levels. For example, the centre's research has led to the implementation of prescribed burns at positions close to housing developments detailed in the 2021 NSW State Plan. It has also resulted in the development of a web-based application: the Bushfire Householder Assessment Tool hosted by the NSW Rural Fire Service (RFS). This application enables householders to assess how well prepared they are for bushfire, and develop a personalised bush fire survival plan.

"I'm very proud of the fact that the RFS, particularly over the last decade or so, has invested enormously in research and research programs and partnerships with organisations. Our work with the Centre for Environmental Risk Management of Bushfires, in partnership with the OEHL, has been a wonderful example."

– NSW RFS Commissioner, Shane Fitzsimmons



Professor Ross Bradstock, Dr Christine Eriksen and Alan Green assessed how prepared for bushfires houses in risk areas were.

Better customer service

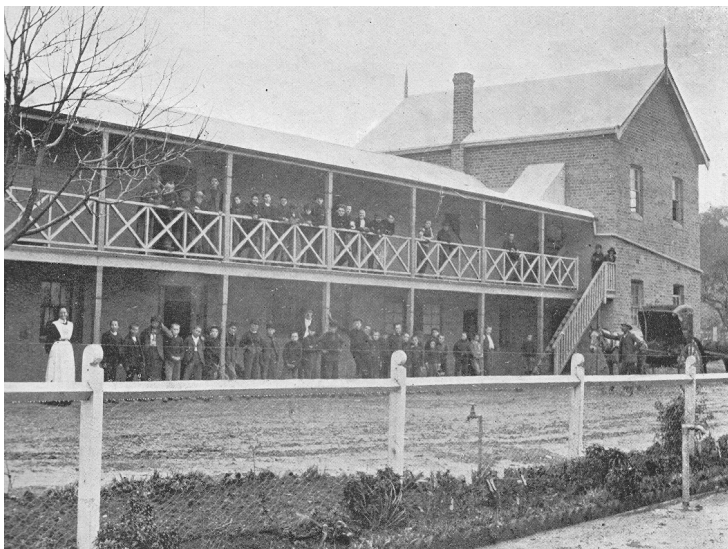
Serving the community well depends on understanding people's attitudes and experiences across the lifespan and recognising the intersections between the law, health and other services they must navigate. Drawing on knowledge from across research disciplines is helping governments and other service providers improve how they interact with their customers, how they respond to consumer views and needs, and how they provide citizens with useful resources to inform their decisions.

Connecting with the past

An online resource has transformed how people raised in orphanages, children's homes and foster care (care leavers) and their families can learn more about their histories and locate and access their personal records. Find & Connect brings together historical resources relating to institutional care in Australia to help Forgotten Australians and Former Child Migrants and people from the Stolen Generations.

Following the 2009 Prime Ministerial Apology to the Forgotten Australians and Former Child Migrants, Professor Shurlee Swain from the Australian Catholic University (ACU), along with colleagues from the University of Melbourne, received funding to create a national resource that would enable care leavers to access their personal government and institutional records. Previous access to full and accurate records was difficult because there was no comprehensive or integrated records database within and across Australia's states and territories. ACU employed local historians in each state to research, collate and update records.

Care leavers have reported that the resource has helped them to reclaim their identities. They particularly appreciate being able to see photographs as way to reconnect with their memories and identities. Access to records also facilitates better-informed counselling services. The website connects carer leavers from NSW to Wattle Place, a service to support those people who grew up in orphanages, children's homes, institutions and foster homes in NSW from the 1920s to the 1990s, no matter where they live.



No 4 Boys Home, Mittagong, c. 1908.
This is a copy of an image that appeared in the State Children's Relief Board Report for the year ending 5 April, 1908.
Courtesy of W.A Gullick, Government Printer and the State of NSW.

Raising awareness about advance care planning

With an ageing population, increasing levels of dementia and rising health care costs, there is a need to encourage advance care planning (ACP) for end-of-life medical decisions. In response, Southern Cross University (SCU) has conducted research and shared knowledge about ACP with health workers, residential and community care staff and the general community. It has also worked with LGBTI people to help ensure that same-sex partners and other family members of choice are involved in end-of-life medical decision-making.

In 2008–09, Professor Colleen Cartwright and colleagues from UNSW Sydney and NSW Health (the funding body), undertook a state-wide study of NSW medical practitioners' knowledge of, and attitudes to, end-of-life medical decisions. The research identified a lack of understanding of the function of various legal instruments involved in such decisions. In response to these findings, the Royal Australian College of General Practitioners established two working parties on ACP. The first developed an Advance Care Planning Position Statement, which became a rallying-call for cultural change within the profession. The second developed on-line ACP training modules for doctors.

In order to disseminate the results of this project, Professor Cartwright delivered over 200 face-to-face presentations to doctors, nurses, allied health workers and aged care staff, legal professionals and politicians, as well as doing radio interviews and writing articles. Today there is much wider acceptance and take-up of ACP across Australia.



Professor Colleen Cartwright speaking about ACP to members of the University of the Third Age Northern Rivers Inc. in Lismore.

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