

VicSTEM

SCIENCE, TECHNOLOGY,
ENGINEERING AND MATHEMATICS

www.education.vic.gov.au/vicstem

STEM IN THE EDUCATION STATE



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MINISTERS' MESSAGE

The pursuit of excellence for every learner is a hallmark of our vision for Victoria as the Education State. This includes pursuing – and achieving – excellence in science, technology, engineering and mathematics ('STEM').

This is an exciting time for STEM in our education system. Significant changes in Victoria's economy mean there is a greater need for STEM capabilities than ever before. Our employers are increasingly looking for workers who are creative problem solvers, innovative and critical thinkers, and able to use new technologies.

STEM skills are also integral to Victoria's priority sectors. These have the potential for remarkable growth, driving up economic output and creating over 400,000 jobs for Victorians by 2025.

In the Education State, we know it is vital to equip Victorian learners – of all ages and backgrounds – with the STEM skills and capabilities they need now, and for the future. We want to ensure Victorians can participate in high quality and engaging STEM learning experiences, with access to leading-edge resources and excellent teaching.

This is why we have been investing heavily in STEM programs and initiatives – like the Let's Count early numeracy program, 10 new Tech Schools, and STEM professional learning.

It is why we have ambitious targets for schools relating to mathematics, scientific literacy, and critical and creative thinking.

And it is why we are transforming our training and TAFE system to support Victorians develop the STEM skills that lead to real jobs and support future industries.

But we know we need to continue to build on these efforts, both across our education system and government. Victoria is falling behind the world's top performers in STEM participation and achievement, and too many people still lack the skills required by a technology and knowledge-based economy.

To maintain a strong focus on STEM, we are rolling out some new initiatives during 2016. These will help us to:

- promote positive early experiences of STEM
- support effective STEM learning, engagement, and collaboration
- connect educators, learners and families with STEM resources, programs, and specialist support
- address the STEM-related training needs of industry, particularly in our priority sectors.

This document brings together all of the actions that will help us to deliver our vision for STEM in the Education State. It is also the start of a conversation about where to head next with STEM early learning, education, and training, and how to involve our communities and businesses in this important work.

For Victorians, STEM can offer some amazing learning opportunities and a wide array of rewarding careers. Ensuring our learners are well-equipped with STEM skills and knowledge – and have the confidence and enthusiasm to use them – will help to secure Victoria's future as a competitive, innovative and vibrant economy.



A handwritten signature in black ink that reads "James Merlino".

The Hon. James Merlino MP
Deputy Premier,
Minister for Education



A handwritten signature in black ink that reads "Jenny Mikakos".

The Hon. Jenny Mikakos MP
Minister for Families
and Children



A handwritten signature in black ink that reads "Steve Herbert".

The Hon. Steve Herbert MP
Minister for Training
and Skills

Congratulations!

Roman Numerals
630 / 1000

- Puzzle Pieces 21/31
- Golden Puzzle Pieces 2/7
- Badges earned 3

Your Score!
95%

You have to have a perfect score on all levels to win the diamond trophy!

630 out of 1000

STEM IN THE EDUCATION STATE

Equipping all Victorian learners with STEM capabilities is an important part of the Education State. We need to build foundational STEM skills in young children, lift STEM achievement in schools, and ensure our higher education and training sectors are creating a STEM-skilled workforce.

STEM EDUCATION AND SKILLS ARE VITAL FOR THE FUTURE SUCCESS OF OUR LEARNERS AND FOR VICTORIA'S ECONOMY

Science, technology, engineering and mathematics (STEM) covers a wide range of knowledge and skills, which are increasingly in demand in a knowledge-based economy and a rapidly changing world.

Quality learning opportunities in STEM disciplines will ensure Victoria has a strong supply of world-class professionals with the specialised skills necessary to compete in the global knowledge economy. Victoria's economy and labour market are shifting towards higher-skilled, knowledge- and service-based industries, new and emerging technologies, and the opening up of global markets.

Development of STEM skills at all stages of life will also inspire curiosity and creativity and drive innovation and growth throughout our economy. Through an exciting and engaging STEM education, learners of all ages can acquire skills that will give them an edge – so they can be smarter and more innovative, and use new and emerging technologies to solve problems and extend their knowledge and understanding.

Quality learning opportunities in STEM can be found at all levels of Victoria's education and training system

For children aged birth to eight years, scientific and mathematical and technological concepts are embedded across the Victorian Early Years Learning and Development Framework. This supports all early childhood professionals to work with families to advance children's learning through problem solving, hypothesising, experimenting, and investigating.

For Victorian schools, STEM is a fundamental part of the Victorian Curriculum. This includes the learning areas of Mathematics,

Employers are seeking a workforce that thinks critically and creatively, and solves complex problems. Whatever their future careers, a strong base of STEM knowledge and skills will equip all learners to engage in dynamic modern workplaces and society.

The Victorian Government is committed to delivering jobs and prosperity to Victorians, and has a strong plan to grow our economy. For Victoria, the key to a prosperous future lies in a highly-skilled workforce, including strong capability in STEM.

The Government has identified that our jobs of the future will be in a number of priority sectors with the potential for remarkable economic growth:

- medical technology and pharmaceuticals
- new energy technologies
- transport, defence and construction technologies
- food and fibre
- international education
- professional services.

In these sectors, Victorians will find high-skill, high-wage jobs, enabling them to compete on an international stage. Critically, STEM knowledge and skills are integral to most, if not all, priority sectors.

Science, Design and Technologies, and Digital Technologies, as well as cross-curricular capabilities such as ethical, critical and creative thinking. In the senior secondary years, a broad range of Victorian Certificate of Education (VCE), Victorian Certificate of Applied Learning (VCAL) and training and TAFE options are available to further develop both general and specific STEM skills.

In the tertiary sector, STEM spans a wide range of higher education and training and TAFE pathways. These can prepare learners for success in STEM-related careers, or provide a solid foundation for the application of general STEM skills within and beyond the workplace.

WHY STEM IS IMPORTANT IN THE EDUCATION STATE

The Victorian Government's focus on STEM is driven by compelling needs at all levels of the education and training system. Our goals for addressing these needs are nested within the broader goals of the Education State reform agenda, and our commitment to make a real difference in the lives of Victorians. Improvement in STEM opportunities and outcomes at all stages of learning are necessary to achieve these goals, and the benefits they offer to the Victorian economy and society.

OVER THE NEXT 10 YEARS, WE WANT TO SEE A SIGNIFICANT IMPROVEMENT IN STEM ACHIEVEMENT IN SCHOOLS

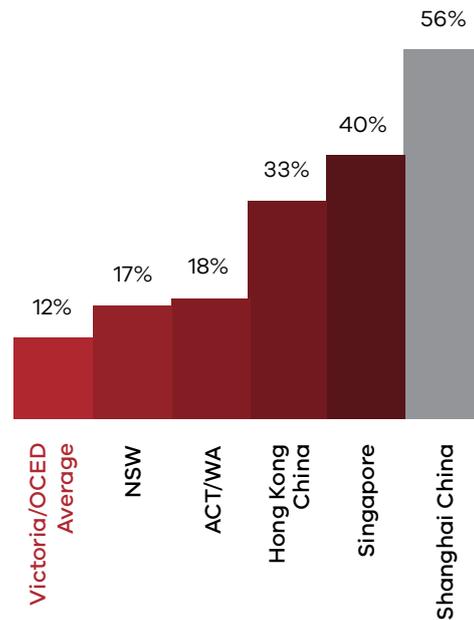
The Victorian Government has set ambitious targets for STEM achievement among Victorian school students. These targets provide direction on what we are aiming to achieve for our students, and how we will measure the success of our system as a whole.

The targets demonstrate our genuine commitment to improving outcomes in STEM achievement among Victorian students.

In general, Victoria performs at or above national and international standards on mathematics and science achievement. However, while a

high proportion of students complete VCE mathematics and science, and enrolments in post-school STEM courses are strong, we are still lagging behind the world's top performers. In recent years, numeracy achievement in Victorian schools has stalled.

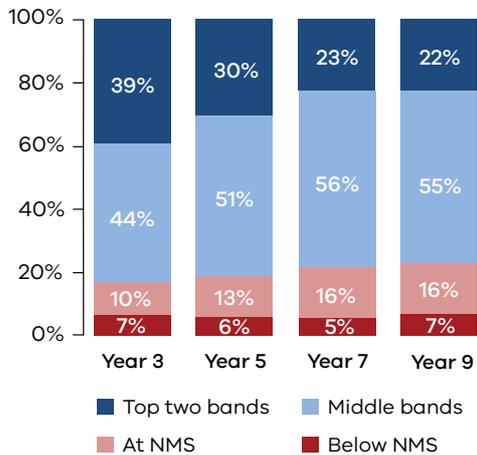
Fewer Victorian students are performing at the highest proficiency levels in mathematics than in comparable jurisdictions



Source: Percentage of students at Level 5 or higher in mathematics literacy (15 year-olds), Programme for International Student Assessment (PISA), 2012

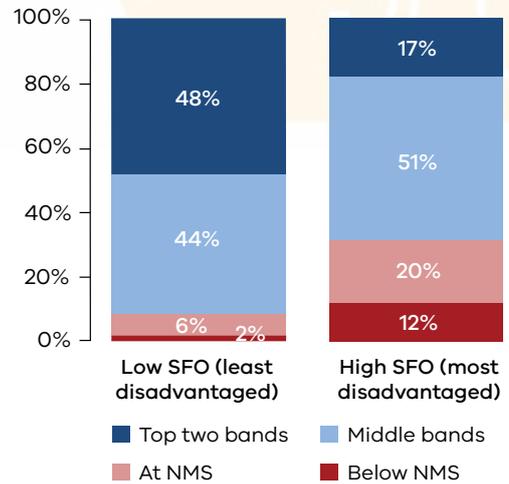


The proportion of high-performing students in numeracy declines as students move through school



Source: Numeracy achievement, National Assessment Program – Literacy and Numeracy (NAPLAN), 2015 ('NMS' is National Minimum Standard.)

Students experiencing disadvantage are less likely to achieve in the top NAPLAN bands for numeracy



Source: NAPLAN, 2015 ('SFO' is Student Family Occupation index)

There is a similar pattern in national assessments of information and communication technology (ICT). While Victoria has maintained its performance standard in ICT literacy at Year 6, there has been a marked decline in performance at Year 10. And we have seen a decline in the proportion of Victorian students performing at the top bands at both year levels.

Lifting students' proficiency in STEM also means developing STEM proficiency in our teaching workforce. This includes ensuring an adequate supply of teachers with contemporary content knowledge in STEM subjects, and the pedagogical skills to stimulate their students' interest and learning.

The Education State reform agenda also aims to reduce the impact of disadvantage on achievement. We know that student socio-economic background has a strong relationship to achievement outcomes, and this is clearly evident in STEM subjects.

Boosting all students' achievement in STEM will make a strong contribution to reducing the impact of disadvantage on achievement across Victoria.

Our ambition is that more students will excel in mathematics and scientific literacy, and develop strong critical and creative thinking skills

- Over five years for Year 5, and 10 years for Year 9, 25 per cent more students will be reaching the highest levels of achievement in mathematics.
- Over 10 years, there will be a 33 per cent increase in the proportion of 15 year olds reaching the highest levels of achievement in scientific literacy.
- Over 10 years, more students will reach the highest levels of achievement in critical and creative thinking.

BUILDING FOUNDATIONAL STEM SKILLS NEEDS TO START WHEN CHILDREN ARE VERY YOUNG

Young children experience rapid brain development and acquire skills at a faster rate than at any other time in life. Children are born curious and ready to explore the world around them. An emphasis on developing STEM skills in

the early years can encourage children to feel positive and enthusiastic about STEM, leading to interest and achievement later in life.

Quality early childhood experiences are the foundation of lifelong learning and wellbeing. Families and early childhood educators play an important role in supporting the development of children's STEM skills, through play and learning, and through their everyday interactions.

However, some parents lack confidence in guiding their child's mathematical and scientific development, and may focus more on reading than numeracy activities. Many early childhood educators are also uncertain about which mathematical and scientific concepts to teach, and how to engage children in experiences that support STEM learning.

Early learning in STEM involves things like knowing the names of numbers, describing sizes and quantities, and beginning to sort objects and recognise patterns. It also includes inquiry-based experiences, and using technologies to investigate and to solve problems.

At home, many everyday activities can provide fun STEM learning opportunities.

For example, cooking teaches children about numbers, measurement, and science. Songs, books and games often involve numbers and counting. Many valuable early STEM learning opportunities can be sparked by children's natural curiosity about the world around them (for example, "how far is it to the moon and back?"). Early childhood educators and family members can learn alongside children, as they share in their early investigations and discoveries.

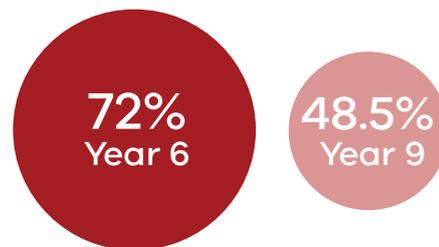
LIFTING STEM ACHIEVEMENT REQUIRES IMPROVING STUDENT ENGAGEMENT IN STEM, ESPECIALLY FOR GIRLS

Student perceptions of STEM as too difficult, or not relevant, are a significant challenge that needs to be addressed.

Many students become less interested in, and positive about, mathematics and science as they get older. By Year 9, far fewer students view these

subjects as fun and interesting, compared with Year 6 students.

A significant proportion of Year 9 students do not think science is important to their future

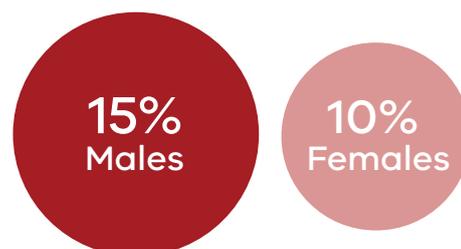


Source: Proportion of Year 9 students who think science is important, Victorian Auditor-General's Office, 2012

There is a gender gap in participation and engagement in STEM, which widens as students get older.

Throughout school, girls are more likely than boys to express a lack of confidence in their ability in science and mathematics. Even many high-achieving girls have low levels of confidence. This translates to a gender gap in achievement.

Victorian girls are less likely than boys to perform at the highest levels of mathematical literacy



Source: Percentage of Victorian students in the top two levels of mathematical literacy achievement. PISA, 2012

There are also differences in the STEM subjects Victorian boys and girls choose to study at VCE. Female students are far less likely than male students to choose physics, IT, and specialist mathematics, and are more likely to study life sciences, and health and human development.

We need to ensure that Victorian schools are delivering STEM learning experiences that all students see as interesting, relevant and achievable. We also need to overcome any preconceptions that may affect teacher and

student expectations, and send a clear message that all students can enjoy and succeed in STEM.

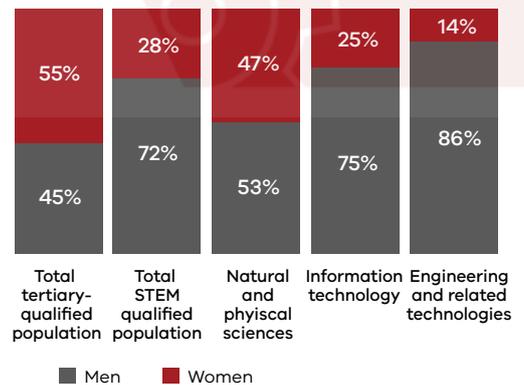
OUR TERTIARY EDUCATION SECTOR NEEDS TO EQUIP VICTORIANS WITH STEM SKILLS

Employment in some STEM-related jobs, like ICT professions and engineering, has been growing at a faster rate than employment in other areas. Over the next five years, employment in professional, scientific, and technical services is predicted to increase.

We need to ensure an adequate supply of STEM graduates that matches workforce demand. This will build on our efforts in the school system, to equip students to pursue a range of STEM study options across higher education and the training and TAFE system.

Improving the gender balance among STEM graduates is another priority in improving equity in STEM participation.

Women are less likely than men to pursue further education and training in STEM fields



Source: Australian Bureau of Statistics (ABS) 2011 Census of Population and Housing



We recognise that workforce-ready STEM graduates need more than discipline-specific skills. They also require flexibility and innovation to apply their knowledge in a dynamic and rapidly-changing labour market. STEM careers may have multiple points of entry and skills development, including graduate, mid-career and re-entry pathways.

The training and TAFE system makes an important contribution to STEM skills development. We need to ensure Victoria's training sector listens and responds to the demands of industry for STEM skills and expertise, and can enable our priority sectors to prosper. This is important because businesses and employers have told us:

- They are increasingly seeking an adaptable workforce that can use technology, think critically and creatively, and work collaboratively to solve problems.

- Industry and production are becoming technologically advanced, and require workers with strong STEM skills and analytical abilities.

Higher education and the training and TAFE system also play a valuable role in boosting foundational STEM skills for adult learners. Recent estimates suggest that over half of the Australian adult population has not reached the international numeracy benchmark required to work in a knowledge-based economy. Re-engagement with the education and training system through upskilling and retraining provides an opportunity to support ongoing development of core skills.





WE ARE TAKING ACTION TO IMPROVE STEM EDUCATION AND SKILLS

We are creating positive early experiences of STEM, through the Let's Count program. We are investing in Tech Schools and professional learning programs with initiatives to support high quality STEM teaching and learning in schools. And we are helping Victorians to develop the STEM skills that lead to real jobs by transforming Victoria's training and TAFE system.

WE ARE CREATING POSITIVE EARLY EXPERIENCES OF STEM

High quality early childhood education and care are associated with improved outcomes for children's learning and wellbeing. When supported to develop early STEM skills through play and other meaningful day-to-day activities, children develop more positive views about mathematics, science and technology.

We are investing in the Let's Count early numeracy program

Let's Count will support 500 Victorian educators and 7500 Victorian families to create experiences that stimulate STEM learning.

Designed for three to five year olds, Let's Count helps to build STEM into early learning. Delivered

by the Smith Family, Let's Count emphasises mathematics in everyday life, helping families and young children to see mathematics as relevant, stimulating and fun.

Importantly, Let's Count supports families experiencing disadvantage. One in four children growing up in disadvantaged communities does not have essential mathematics skills. Children who do not develop these skills early tend to fall behind and stay behind.

Through Let's Count, families and early childhood educators will develop the confidence and skills to support children's understanding of mathematical concepts, through play and other day-to-day experiences. It will help children to develop stronger skills and positive attitudes towards mathematics – a recipe for future success.



WE ARE SUPPORTING HIGH QUALITY STEM TEACHING AND LEARNING IN SCHOOLS

We are investing in high quality STEM teaching and learning in Victorian schools. This will ensure all students have access to STEM expertise, leading-edge technology, and the latest advancements in a rapidly changing STEM environment.

We are supporting high quality teaching and learning through the Framework for Improving Student Outcomes

The Framework for Improving Student Outcomes supports excellence in STEM teaching, learning and leadership in every school and classroom.



This Framework uses the latest research on student learning to help schools to focus their efforts on key areas that are known to have the greatest impact on school improvement.

The Framework's Improvement Model (pictured) is structured around four state-wide priorities that are proven to have a strong bearing on the effectiveness of a school.

For STEM, 'excellence' means:

- Teachers have the content knowledge, teaching skills, time and resources needed to ensure good learning outcomes for all their students.

- Students find learning STEM subjects exciting, challenging and linked to real-world situations.
- Students are encouraged and inspired to improve, excel, pursue their interests in STEM, and understand the diverse pathways and careers that STEM can offer.

We know that highly capable leaders can raise the profile of STEM in their schools, drive sustained improvement in school and classroom practices, and lift STEM performance and engagement. They can also pursue collaborative approaches with other schools, organisations, and their broader communities, to share STEM expertise and resources.

To achieve quality and excellence in STEM, we need:

- Rigorous, engaging, age-appropriate STEM content.
- Teachers and educators who are able to excite children and young people about STEM, and demonstrate the relevance of STEM learning.
- Communities and families who value STEM learning and knowledge, and can support this in everyday life.

The Framework for Improving Student Outcomes helps to achieve these objectives by identifying best-practice teaching methods proven to improve student outcomes.

The \$82.2 million Learning Places regional support initiative is making this Framework a reality. We are putting in place new multi-disciplinary teams to give schools, students and their families local access to a range of experts, facilitate collaboration, and assist principals in planning how to lift student achievement.

We are investing \$128 million in 10 Tech Schools

The jobs of the future lie in knowledge and ideas, and our children will need to be smarter and more creative than ever before. The Tech Schools initiative is bringing together schools, TAFEs, universities, and industry to provide students with access to innovative shared learning environments and leading-edge technology.

Each Tech School will provide exciting new opportunities for young people to discover and develop the skills they need for lifelong learning and future careers. Local partnerships and school communities will shape the specialities and subjects on offer, making each Tech School unique.

Students will still be enrolled in their local secondary school, but will be able to attend classes at a Tech School campus that is shared with the many other schools in their region. Tech Schools will be co-located on TAFE or university campuses, as a way of introducing students to the tertiary education environment and raising awareness of pathways into further education and training.

Watch out for the first Tech Schools opening in 2017.

We are investing \$30 million in professional learning programs that build teachers' capability to teach and promote STEM

To achieve excellence in learning and teaching STEM we are:

- **Expanding the Primary Mathematics and Science Specialists initiative.** To build STEM expertise in the early years of schooling, 200 teachers are being trained as mathematics and science specialists. The program will target disadvantaged schools – including low socio-economic status, rural and regional schools – as well as schools with low achievement in mathematics and science.

Each of the specialists will complete 20 days of professional learning over two years. They will split their time between classroom teaching and providing professional learning and support to other teachers within their school.

The program builds on previous success in training 200 teachers in 114 primary schools. We know this worked. We saw consistent improvement in teacher capacity, confidence and knowledge, as well as increased student engagement and achievement.



- **Rolling out the Secondary STEM Catalysts Program.** We are training 60 teachers across 30 secondary schools to become STEM Catalysts – teachers who will become experts in STEM teaching, and inspire fellow teachers to bring STEM to life for Year 7 and 8 students.

Each Catalyst will participate in a post graduate certificate delivered by Deakin University.

Two Catalysts from each school will lead, encourage and support changed practice in STEM teaching and learning. The Catalysts will help other teachers in their school to increase students' interest in STEM, using engaging lessons and digital technologies.

We are investing \$21.6 million to support implementation of the new Victorian Curriculum and equip students with the skills to thrive in life and work

The Victorian Curriculum, which sets out what every student should learn, supports improved achievement in STEM.

It includes a strong focus on the STEM skills and capabilities students will need to succeed in their lives and careers. This includes relatively new areas of digital technologies.

We will equip teachers and schools to deliver the priority areas of learning, including STEM, digital coding, and critical thinking. There will be a particular focus on resources for new elements of the Victorian Curriculum, such as digital technologies.

The Digital Technologies curriculum equips students with the problem-solving skills needed to succeed in a knowledge-based economy

Digital Technologies provides students with the opportunity to acquire and apply specific ways of thinking about problem solving to create innovative, purpose-designed digital solutions.

We are building on our cutting-edge STEM facilities and initiatives, that benefit students and teachers across Victoria

These include:

- the network of six Victorian Science and Mathematics Specialist Centres: BioLAB; Earth Ed; Ecolinc; Gene Technology Access

Centre; Quantum Victoria; and the Victorian Space Science Education Centre

- science and selective-entry schools with world class STEM teaching and learning facilities, such as the John Monash Science School
- 'Pathways in Technology' (P-Tech) pilots in Ballarat and Geelong

We know from these initiatives that exciting, real-world learning experiences are vital for student engagement.

WE ARE TRANSFORMING VICTORIA'S TRAINING AND TAFE SYSTEM

The training and TAFE system plays a crucial role in supporting people at various points in their careers to gain skills for immediate employment, as well as improving their long-term prospects and employability.

We are transforming Victoria's training and TAFE system so it meets the needs of students, employers and industry, and supports an economy that encourages new business and investment. We have established the Office of the Victorian Skills Commissioner to help us to create and sustain a first class system.

Skills First is a commitment to a more managed training system, where training providers who have satisfied rigorous standards will get access to Government funding to provide high-quality, industry relevant training to Victorians. Through *Skills First* the Government will ensure industry has a greater voice in which courses the Government funds, students get training that leads to real jobs that benefit the economy and public money is well spent.

Under *Skills First*, the training and TAFE system will:

- prioritise quality training that leads to jobs and economic growth
- ensure training is relevant to existing jobs and emerging skills needs
- establish a more targeted approach to course funding that is linked to real jobs
- adjust eligibility for Government funding so it better supports learners to gain the skills they need in a changing economy.

We are supporting TAFE Institutes through the \$50 million TAFE Back to Work Fund

This Fund supports the Victorian Government's plan to grow jobs and get people back to work, while improving the financial viability of TAFE Institutes and supporting the skills needs of local communities.

Institutes are using this funding to provide training initiatives that will deliver the skills needed in priority growth sectors, help businesses boost productivity, and lead to real jobs – including a wide variety of STEM jobs.

Projects funded so far include:

- \$4.7 million to support training delivery in the emerging areas of 3D manufacturing and cyber security, through collaboration and partnerships with industry groups and employers.

- \$2.4 million to design new educational content that supports online delivery to domestic and international markets, in partnership with Dairy Australia.
- \$1.82 million to develop new courses, expand delivery options, and develop vocational placement opportunities for existing courses in the solar, almond and biomass industries.
- \$2.85 million to transition displaced electrical workers to telecommunications and new energy jobs.
- \$690,000 to deliver training and delivery programs in the new and emerging industry of pre-fabricated construction and the use of alternative and/or recycled building materials.

Our focus on STEM in early childhood, schools and vocational training fits with efforts in the higher education sector

- Government schools co-located on university campuses (John Monash Science School, Nossal High School and Charles Latrobe P-12 College) benefit from close exposure to university activities and facilities.
- Students from secondary schools have the opportunity to link to universities by attending a range of STEM-based outreach and development programs (some of which are specifically targeted at female students).
- Direct entry and alternate pathways from school to university allow some students to pursue bachelor-level science courses (regardless of Australian Tertiary Admission Rank), as determined by individual universities.
- Dual-sector institutions delivering both higher education and training and TAFE system courses offer enhanced credit transfer and flexible pathways into higher education, especially in STEM disciplines such as engineering.

It also spans across the Victorian Government and includes support for leading-edge research and innovation

- The inaugural **Inspiring Women Fellowships**, funded by the Victorian Government through the Office of the Lead Scientist and delivered by veski, ensure outstanding female researchers get the support they need to juggle career and carer commitments and remain competitive in their fields of endeavour.
- The Victorian Government, through veski, will provide 12 **Victoria Fellowships** – six in life sciences and six in physical sciences – in recognition of the important role of innovation to Victoria's economic future, and the need for Victorians to be skilled in STEM.
- **The Premier's Award for Health & Medical Research** recognises and celebrates the outstanding achievements of Victoria's early-career health and medical researchers.
- **The Victoria Prize for Science & Innovation** highlights the many ways in which research and development of international significance are conducted in Victoria.

WHAT'S NEXT FOR STEM IN THE EDUCATION STATE?

During 2016 we are rolling out additional initiatives to support effective and positive STEM learning experiences, in the early years, throughout school, and beyond.

Our new initiatives will ensure teachers and early childhood educators have easy access to a range of exciting, relevant, up-to-date resources and approaches to teaching and learning. They will also help to engage more families and learners in STEM.

We will also be working with Industry to ensure STEM skills of the future are being developed today.

From September 2016, our STEM resources will have a new home – the VicSTEM website: www.education.vic.gov.au/vicstem

VicSTEM brings together a range of STEM resources, activities and programs, helping early childhood educators, teachers, families, and students of all ages to access the information and services they need quickly and easily.

It includes:

- activities and resources for families, early childhood educators, teachers and principals
- new resources supporting the teaching and learning of the new Digital Technologies curriculum
- information on STEM professional learning programs
- up-to-date information on STEM careers and pathways.

VicSTEM will also help to connect schools and educators with organisations that can provide specialist support relating to STEM learning – including industry and universities.



VicSTEM provides information about other new initiatives launched during 2016, including:

The Victorian Maths Challenge

This exciting new Challenge will engage children of all ages in real-life mathematics, using educational, active and fun experiences. It will increase their confidence in, and exposure to, mathematics, through interactive challenges that promote problem solving.

There will be challenges for families and educators of young children, to encourage them to engage early with everyday mathematics. Older children will also be encouraged to undertake the challenges with their families.

Secondary school software suite

The number of computers in our schools has more than doubled since 2009 which is why the Government is investing \$9.3 million over two years to purchase new educational software products. This will ensure Victorian government school students have unlimited access to a comprehensive suite of digital tools. Software provided will support students to understand maths and science concepts, to prepare and analyse data, to plan and present their ideas and design and develop critical and creative thinking skills – skills that are increasingly important in the workplace and in life.



Wolfram Technologies

Within this suite, the Department of Education and Training has entered into a three year agreement for the provision of a range of Wolfram products across all Victorian secondary schools. The suite of products includes the highly regarded Wolfram Mathematica, Wolfram Alpha Pro, SystemModeler, Mathematica Online and Wolfram Programming Lab while the license covers school devices, teacher devices and student Bring Your Own Devices. The Wolfram products are internationally recognised as powerful learning tools across STEM. It has applications in the areas of computation, problem modeling, coding and more.

The Victorian Games and App Challenge

In 2016, the Premier announced a challenge to encourage creativity around coding open to all Victorian school students in Years 6, 8 and 10. Students are invited to submit their ideas to solve an authentic problem and develop a prototype for an app or a game. Individuals or teams may enter the Victorian Games and App Challenge. The Challenge will run during Term 3, 2016, with finalists to be showcased during the Melbourne Games Week, in October 2016.

Consolidating the network of six Victorian Science and Mathematics Specialist Centres

Stronger collaboration is helping each Centre to inspire a passion for STEM in more students and teachers. Improved coordination across the Centres is maximising student and teacher participation, and enabling connections to be made across relevant STEM bodies. The network of Centres provide specialised programs, accessible by all Victorian students (P–12). The programs encompass new and emerging scientific thinking, state of the art facilities and cutting edge technologies. Face-to-face onsite, online and outreach programs are available. Programs are free for rural and disadvantaged metropolitan schools.

A card deck that supports early childhood professionals to use digital technologies effectively

The card deck (Taking Small BYTES) will feature 100 digital experiences and a further 360 complementary 'unplugged' play based learning experiences to support educators to implement the Victorian Early Years Learning and Development Framework outcomes. Many of the activities will relate to key skills and concepts, such as thinking, numeracy, communication, collaboration, and creativity.

This resource will have a strong focus on educating young children in the safe and responsible use of technologies. It will showcase the range of early years learning experiences that are possible when digital technologies are used to support children's learning and development.



The revised Victorian Early Years Learning and Development Framework

The Victorian Early Years Learning and Development Framework has been strengthened to support early childhood professionals to further recognise STEM as part of the learning outcomes for all children.

The Framework shows how the learning and development outcomes link with the new Victorian Curriculum. For example, there are many links between outcomes in 'learning' and 'communication' and the subject areas of mathematics and science.

This will help families and early childhood professionals to understand how early engagement in STEM concepts and experiences can create interest and build foundational skills in mathematics, science and technology.

The Victorian Skills Commissioner

The Victorian Skills Commissioner provides advice to the Government on how the training and TAFE system can better support the economy and jobs by addressing skills shortages, meeting workforce training needs and improving productivity for employers. He has developed a new industry engagement framework for the training system that will support analysis of the training needs of existing and emerging industries, including the

Government's priority growth sectors, to ensure a capable workforce. The Commissioner will also play a role in promoting the available training pathways that lead to jobs and skills development in the workforce.

The Commissioner's role includes:

- analysing the training and workforce needs of existing and emerging industries
- promoting industry input into the training and TAFE system
- collaborating with relevant agencies to coordinate the training and TAFE system with the Victorian Government's economic policies.

A workforce training innovation fund

Skills First will feature a new annual \$40 million Workforce Training Innovation Fund (WTIF). This program will fund partnerships between industry, TAFEs and training providers to deliver innovation in workforce training, skills development and applied research.

The Fund will provide scope and support for innovation in the training and TAFE system to respond to changing employment and workforce skill requirements and is aligned with the Victorian Government's broader economic development agenda and priority sectors/industry strategies.



LONGER TERM REFORM DIRECTIONS FOR STEM

ACHIEVING OUR AMBITIONS FOR STEM – AND VICTORIA'S ECONOMY – WILL REQUIRE A SUSTAINED AND INTEGRATED APPROACH

The investments we have made already will get us a long way towards reaching our school targets for mathematics and scientific literacy, and to improving outcomes for learners of all ages. However, the targets are ambitious and will require a sustained approach and potentially further support for improvements in STEM learning.

The targets also link with our broader ambitions for Victoria, and our plan to grow jobs, secure investment, and generate business. This includes helping Victorians to develop new skills to invigorate our economy and meet the needs of our future industries.

STEM is a key part of our entire education system. It involves lifelong learning, and skills and expertise that develop over time. It can also involve different approaches to learning and teaching for different groups of learners, including female students and families experiencing disadvantage.

This means we need to continue to focus on STEM in the early childhood, schools, and higher education and skills sectors, and transitions between sectors. We will also seek to maximise the benefits for Victoria of Commonwealth-generated initiatives, such as the National STEM School Education Strategy and National Innovation and Science Agenda.

An integrated approach is vital to ensure all Victorians are equipped with the STEM skills and knowledge they need, throughout their lives. We are committed to working across our education system, and with industry and other interested

parties, to achieve our ambitions for Victorian learners, the economy, and the Education State. This will ensure our education system remains highly relevant to learners and industry, particularly in priority sectors.

SUPPORTING FAMILIES AND EARLY CHILDHOOD EDUCATORS

Some families may not know which everyday activities to use to explore different STEM concepts with their children. Early childhood educators may lack confidence when it comes to using STEM-focused language and engaging children in intentional play-based experiences.

There are opportunities to do more to support families and educators to engage young children in STEM, and to create high quality learning environments.

- For early childhood settings, this could involve further resources and professional learning to build educators' confidence and capability in STEM.
- For families, we could raise awareness of how to engage young children in STEM in the home environment. Resources could help families to develop the enthusiasm, confidence and skills needed to support their young child's learning in numeracy, science and technology.

We also need a strong evidence base so we can identify future areas of focus relating to STEM and early childhood. The 'Numeracy@Home' research project – due for completion in 2017 – will contribute to this. Implementation of the findings will also help to make families aware of what they can do at home to encourage their children to enjoy mathematics.

CONTINUING TO FOCUS ON STEM IN SCHOOLS

Ongoing monitoring of our performance against the Education State targets, and feedback from schools, will help us identify where and when additional work is needed in the medium to long term.

Areas for future action in schools will be focused on the priorities in the Framework for Improving Student Outcomes, and could include:

- identifying ways to attract more STEM graduates to teaching, to ensure a supply of qualified teachers into the future
- building expertise in our current teachers and leaders to deliver exciting and effective STEM teaching and learning programs
- supporting more students, including girls and other underrepresented groups, to excel in STEM, become confident in their STEM-related abilities, understand the relevance of STEM learning to a diverse range of jobs, and pursue STEM careers
- engaging families and communities in STEM learning.

STRENGTHENING STEM IN HIGHER EDUCATION AND SKILLS

As we finalise and implement our reforms to the training and TAFE system, we will:

- continue to build STEM knowledge and skills across relevant areas of the workforce

- work with the Commonwealth, industry and providers to refresh training and TAFE priorities and products to reflect the importance of general and specific STEM skills.

We will work with universities to determine how we can maintain a focus on STEM learning and, in particular, support women to excel, including through enhancing direct links with schools.

We will also look for ways to strengthen links between STEM-related industries, schools, the training and TAFE system and higher education providers. This could help to provide learners with opportunities to develop and use STEM skills and knowledge in real-world situations, have access to real experts and technology, and support careers planning and pathways into further education and training. This could be a future role of the new Tech Schools, for example, where these are co-located on TAFE or university campuses.

CONCLUSION

Rapid developments in science and technology have affected everything we do, including how and where we work. And just as the world around us has changed, the skills and knowledge we need have changed, too.

Victoria is well-placed to take advantage of future demand for STEM skills. Through the Education State, our education system is not remaining stationary and is set to play a critical role in meeting tomorrow's employment challenges. By transforming how and what we teach our children and young people, we can unleash the talents of future generations.



