Unpacking the Digital Technologies Curriculum

Aleida Mabarrack

Tuesday, 3 July 2018

Association of Independent Schools of South Australia

Acknowledgment of Country

I acknowledge that we meet and learn on Aboriginal Land and pay respect to the Indigenous Elders of the past, present and future.

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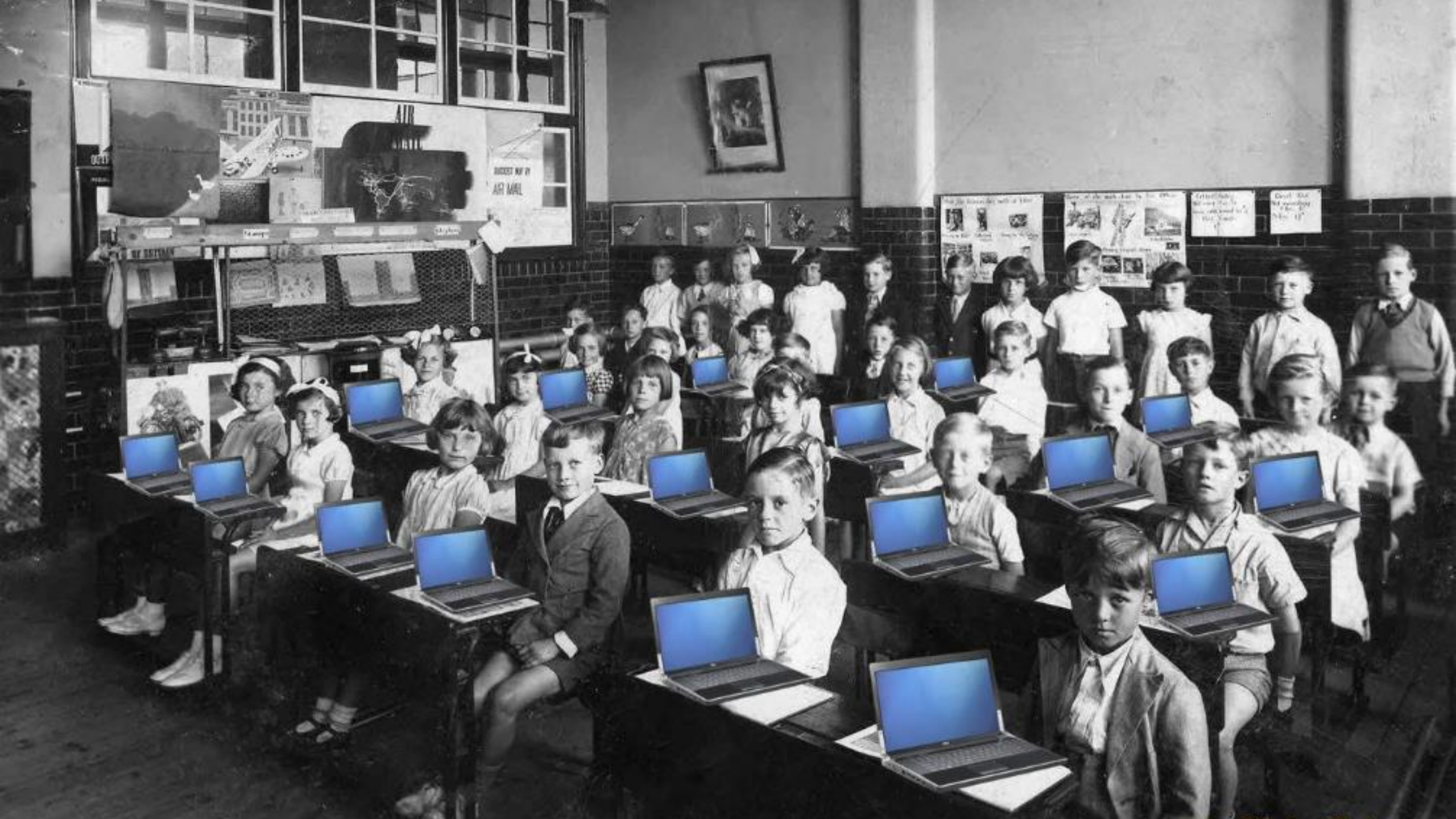
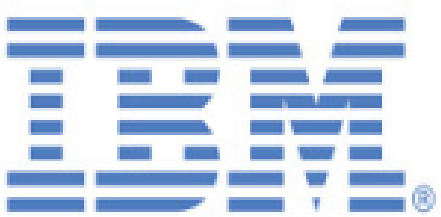



Ar

"I think there is a world market for maybe five computers."

Thomas Watson, president of IBM, 1943



At the dawn of the computer industry, nobody really knew where this new technology would take us. But the explosion of desktop computing that put a PC in nearly every American home within 50 years seems to have eluded the imagination of most mid-century futurists.

After all, when IBM's Thomas Watson said "computer," he meant "vacuum-tube-powered adding machine that's as big as a house." It's fair to say that few people ever wanted one of those, regardless of the size of their desk.

www.pcworld.com

Why Technologies?

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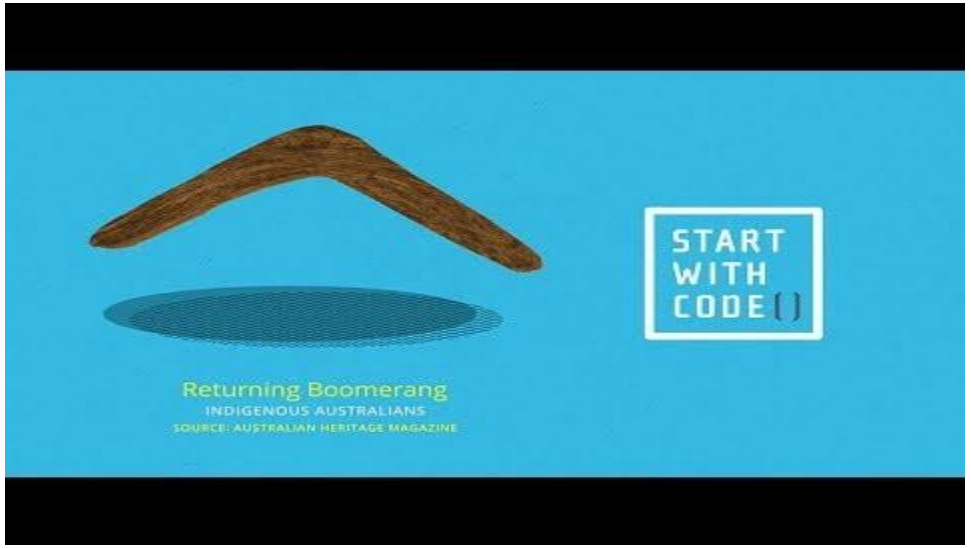
START
WITH
CODE()
Returning Boomerang
INDIGENOUS AUSTRALIANS
SOURCE: AUSTRALIAN HERITAGE MAGAZINE

www.fya.org.au

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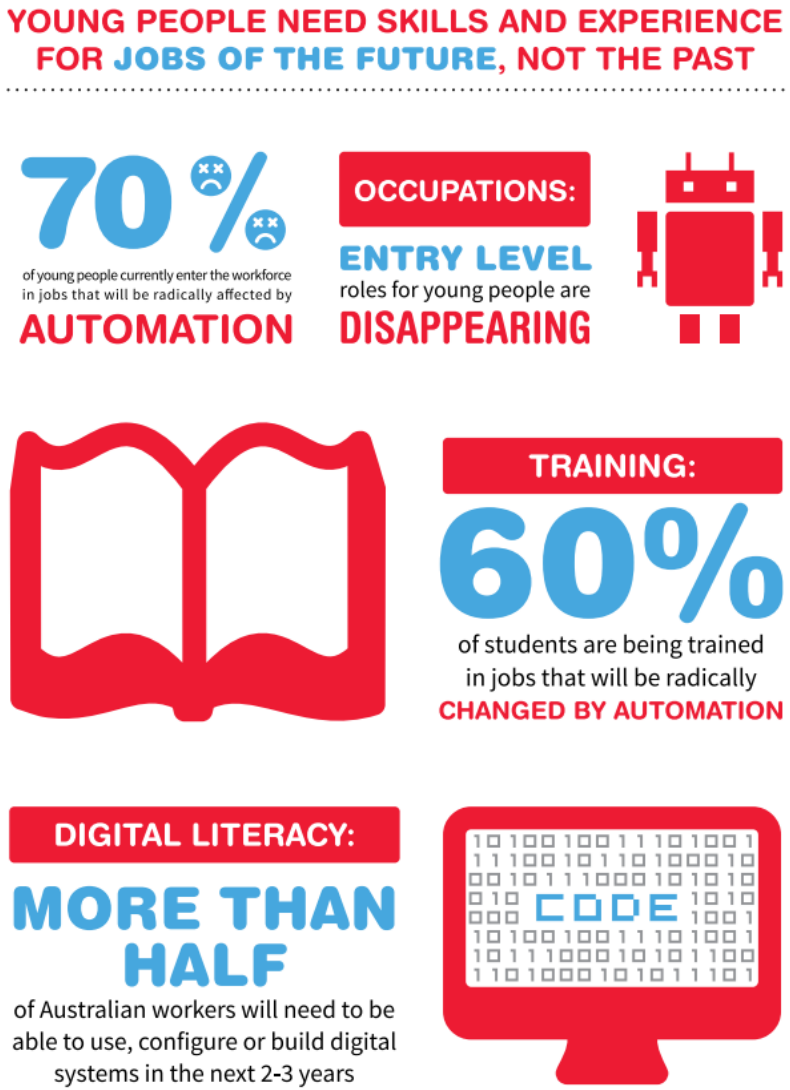

The New Work Order
(FYA, 2014)

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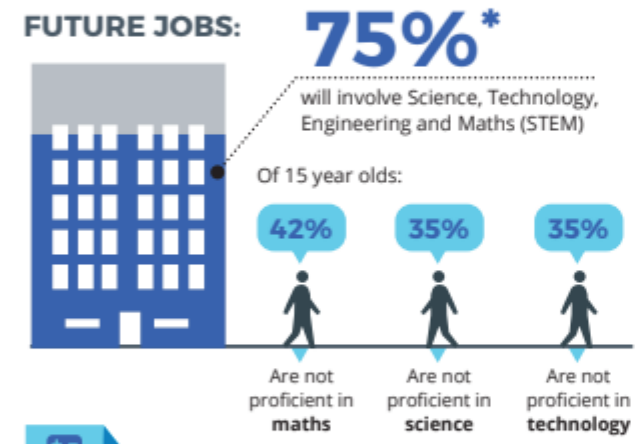
Young people are staying longer in education which will help for the high skilled work of the future

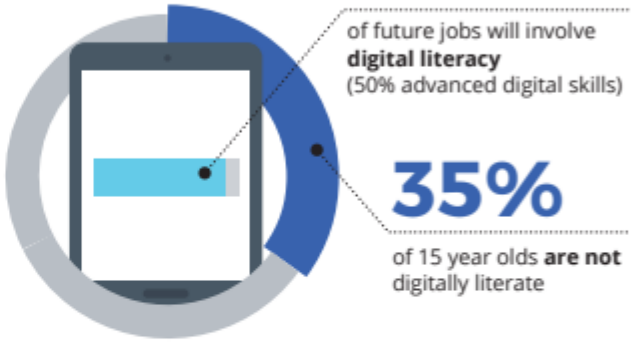
- Education participation, attainment and retention are increasing in general.
- The exception is Indigenous young people (15-19), whose participation has decreased since 2008.

Despite this, a significant minority are not developing the enterprise skills they will need for future work



Proficiency in maths, science and reading is getting worse and Australia is falling in international ratings.

The majority of Indigenous* young people, (as high as 77% for maths), are **not proficient** in the skills that will be sought after in future work.

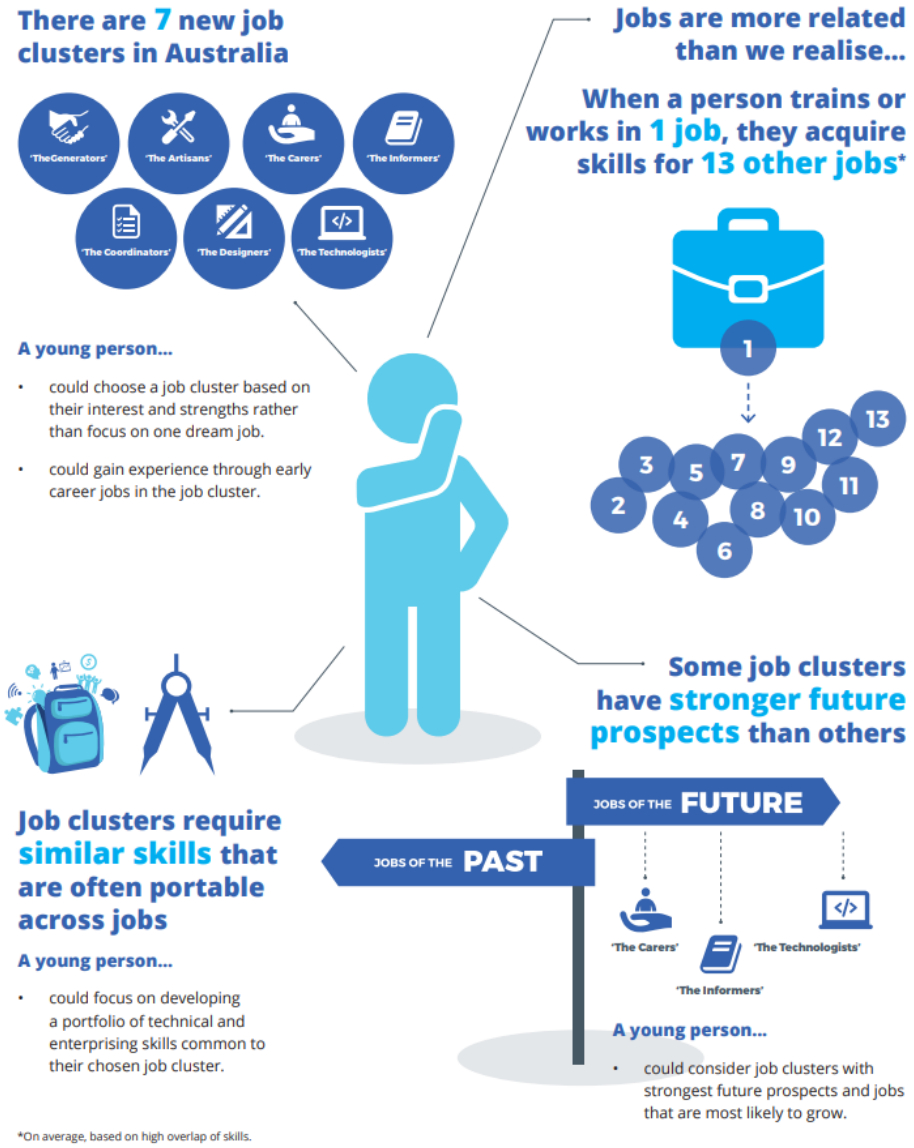


While work of the future will involve young people managing a 'portfolio' of flexible work, of 15 year olds:

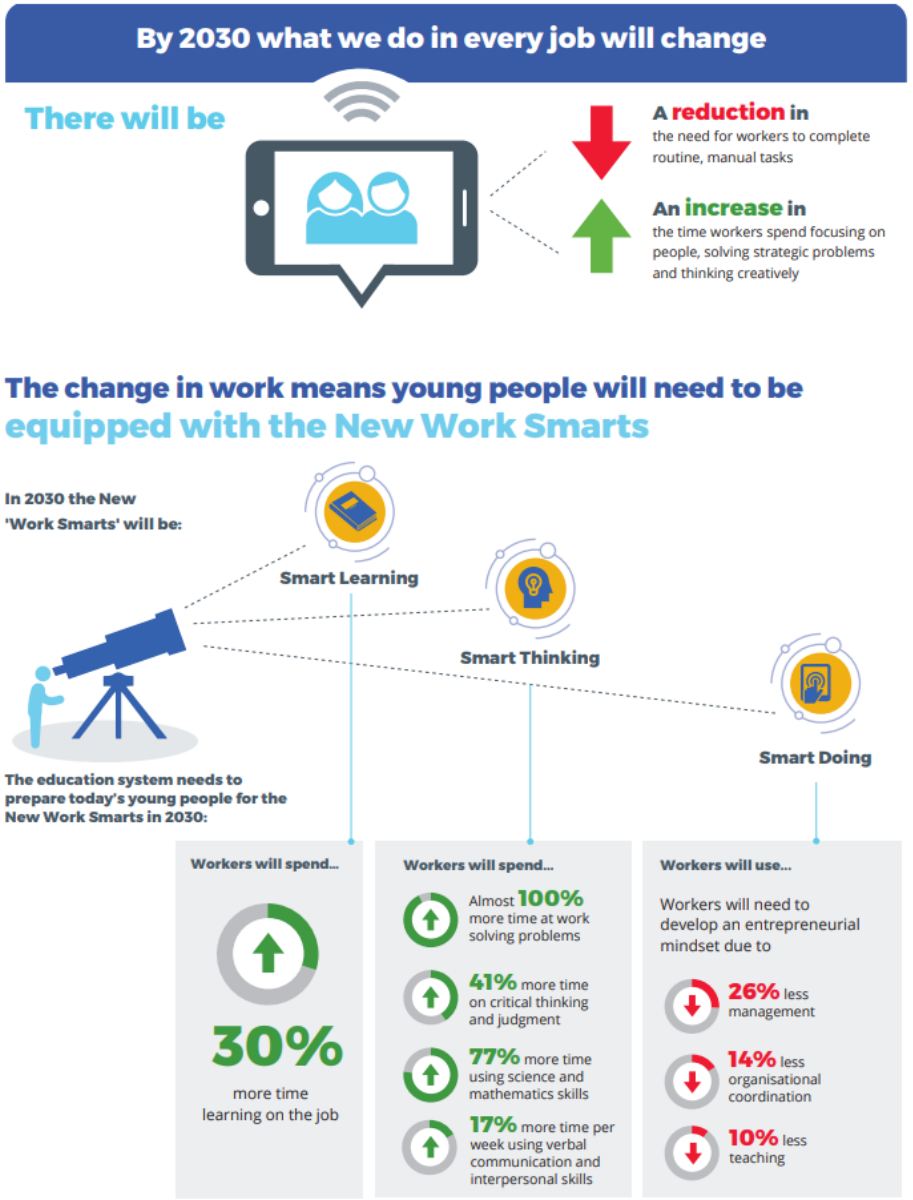
* PwC *A smart move* 2015

* Throughout this document the term 'Indigenous' is used to refer to both Aboriginal and/or Torres Strait Islander peoples. Unless noted otherwise, the term should be considered inclusive of both Aboriginal and Torres Strait Islander peoples.

(FYA, 2015)


There are 7 new job clusters in Australia
'TheGenerators'
'The Artisans'
'The Carers'
'The Informers'
'The Coordinators'
'The Designers'
'The Technologists'
Jobs are more related than we realise...
When a person trains or works in 1 job, they acquire skills for 13 other jobs*
1
2
3
4
5
6
7
8
9
10
11
12
13
A young person...
could choose a job cluster based on their interest and strengths rather than focus on one dream job.
could gain experience through early career jobs in the job cluster.
Some job clusters have stronger future prospects than others
JOBS OF THE FUTURE
JOBS OF THE PAST
'The Carers'
'The Informers'
'The Technologists'
A young person...
could consider job clusters with strongest future prospects and jobs that are most likely to grow.
Job clusters require similar skills that are often portable across jobs
A young person...
could focus on developing a portfolio of technical and enterprising skills common to their chosen job cluster.
*On average, based on high overlap of skills.

(FYA, 2016)



(FYA, 2017)

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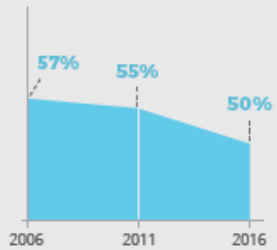
SNAPSHOT

This report followed 14,000 young people's journey over a decade (15 to 25 years old) and found...

At 25 years-old

50%

are not working full-time*



***Note:** Working full-time is defined by the Australian Bureau of Statistics as working 35+ hours per week.

Full-time education

Young people are better educated than in the past with almost 60% of 25 year-olds holding a post-school qualification.

Barriers young people identified to full-time work

- Not enough work experience
- Lack of appropriate education
- Lack of career management skills
- Not enough jobs

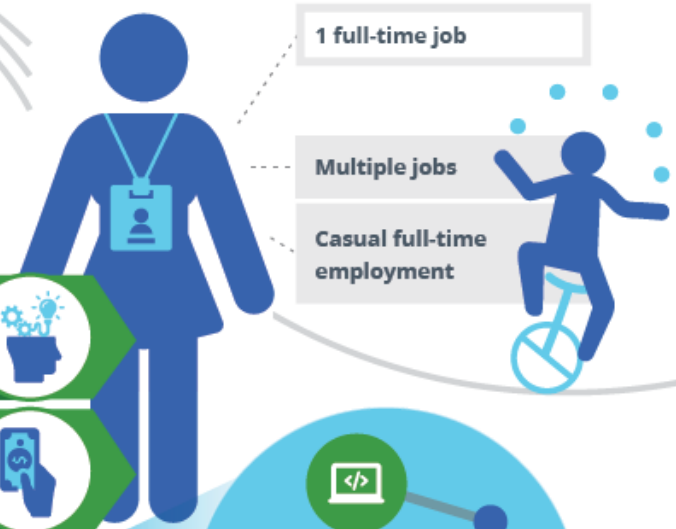
Accelerating factors to gaining full-time work

- Building enterprise skills in education — 17 months faster
- Relevant paid employment — 12 months faster
- Paid employment in future focussed clusters — 5 months faster
- An optimistic mindset** — 2 months faster

The New Work Reality

Full-time work

Full-time work is increasingly precarious and difficult to attain.



- 1 full-time job
- Multiple jobs
- Casual full-time employment

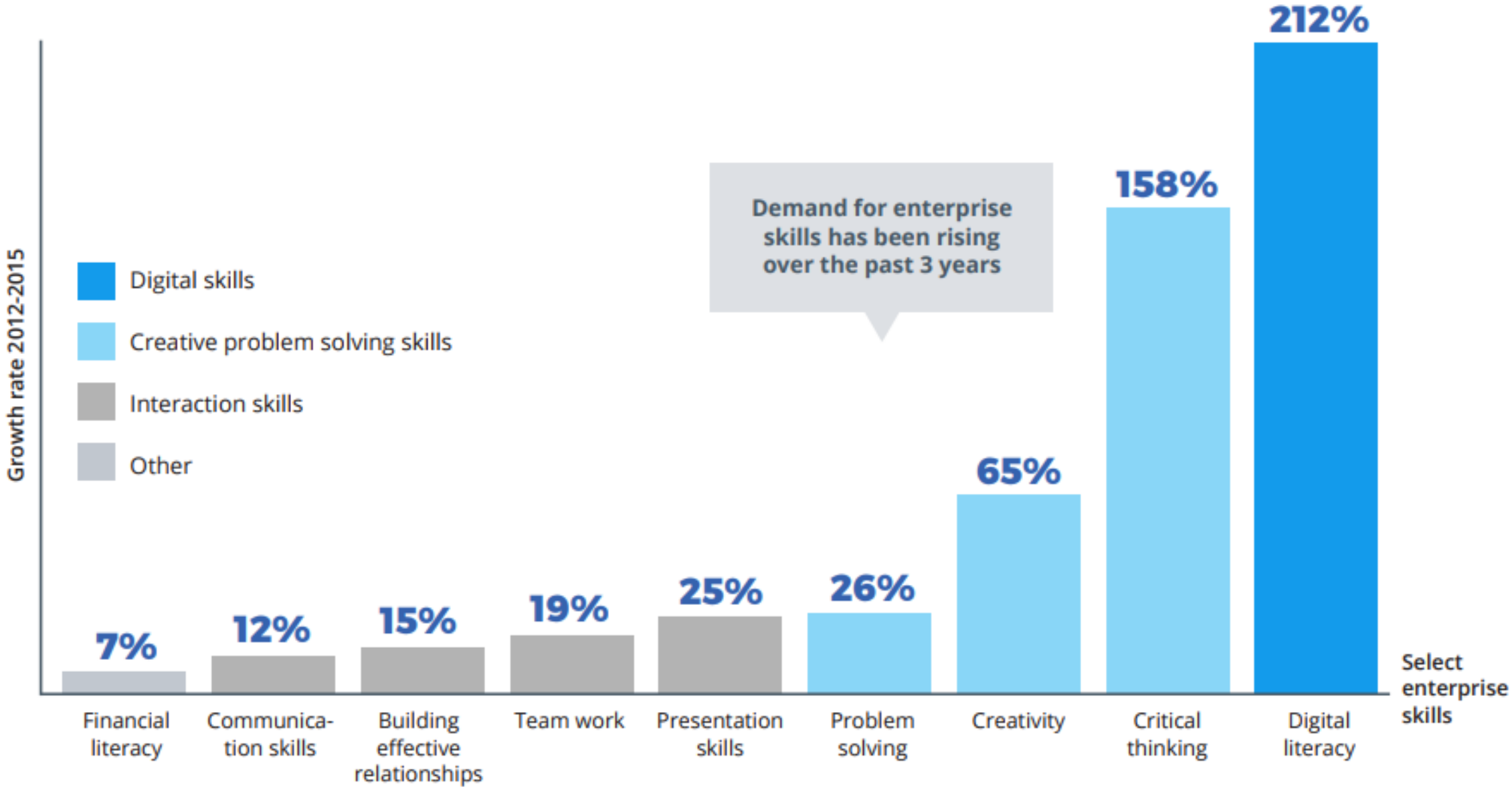
**Note: Respondents were asked at 18 years-old whether they were happy with their career prospects at 18.

Source: Census table builder (2006, 2011, 2016), AlphaBeta analysis. LSAY 2006 cohort, AlphaBeta analysis. Australian Bureau of Statistics (1992-2013), Australian Labour Market, cat. No. 6105.0. Australian Bureau of Statistics (1978-2018), Labour Force, cat. no. 6202.0. Foundation for Young Australians (2016), "The New Work Mindset".

(FYA, 2018)

Exhibit 2: Recent growth in demand for select enterprise skills

Growth in proportion of jobs requesting each skill, %, early-career jobs, 2012-2015[12]



Emoji translator wanted - London firm seeks specialist

By Nalina Eggert
BBC News

12 December 2016 | World

Share

A company in London has advertised for an emoji translator in what is thought to be the first such job worldwide.

The role will involve explaining cross-cultural misunderstandings in the use of the mini pictures, and compiling a monthly trends report.

Agency boss Jurga Zilinskiene said emojis were a "potential growth area" as "inconsistencies" had developed in their use.

Technologies in the Australian Curriculum

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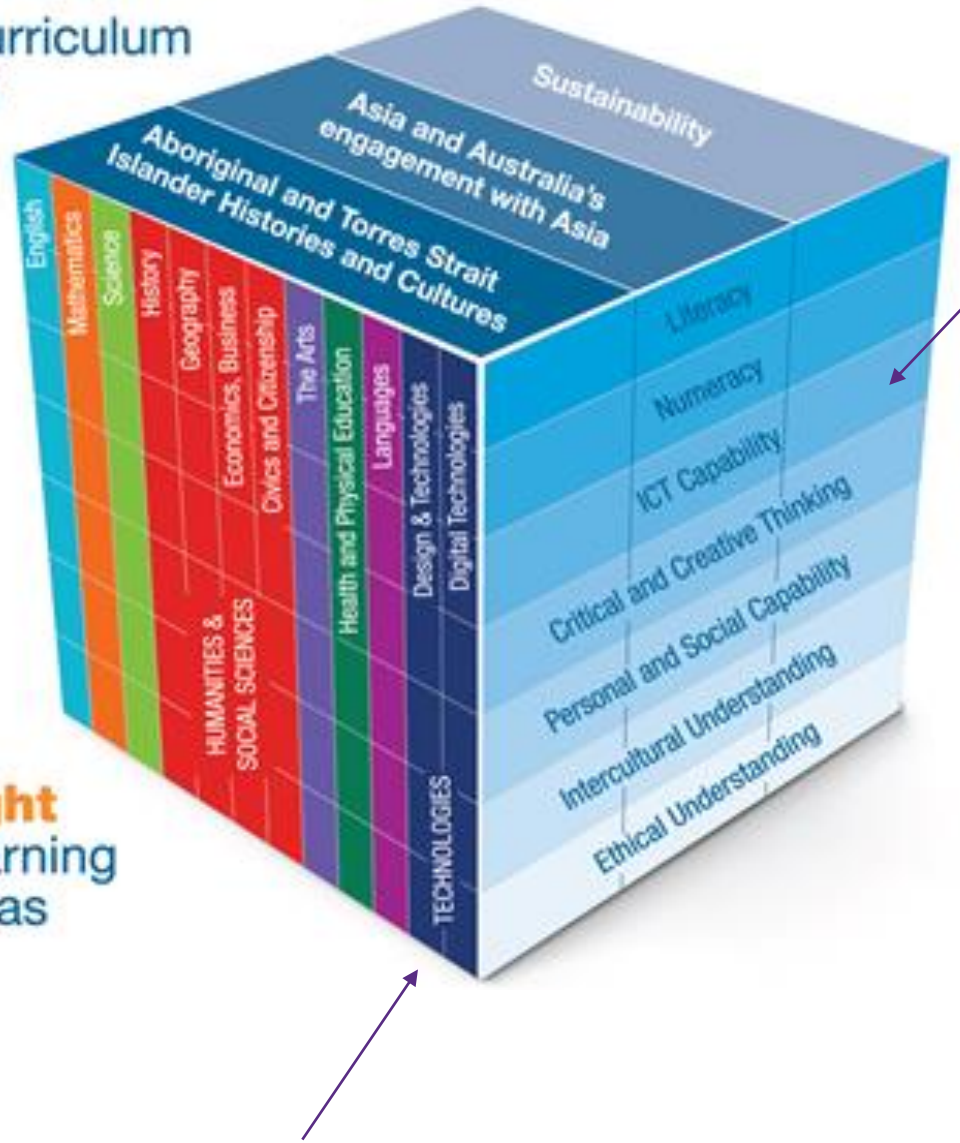
Three
Cross-curriculum Priorities



Seven
General Capabilities

Eight
Learning Areas

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3.0

Consists of two subjects and one capability:

- Digital Technologies
- Design and Technology
- ICT General Capability

Digital Technologies: Understanding how those ICTs actually work and learning: a literacy in coding, how to create technology and about digital systems (hardware and software). It also involves developing skills in being able to think in new and innovative ways to solve problems.

Design and Technologies: Students use design thinking & technologies to generate & produce designed solutions for authentic needs & opportunities

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Foundation	1 - 2	3 - 4	5 - 6

Technologies

Through exploration, design and problem-solving, students learn how technologies work.

Typically, students will:

in Design and Technologies

- design and create solutions to challenges through guided play and by safely using materials and equipment

in Digital Technologies

- work safely online, represent data as pictures, symbols and diagrams, and sequence steps to solve simple problems.

Uses a tablet to sequence steps

Technologies

Through exploration, design and problem-solving, students learn how digital and other technologies work and how to create solutions with technologies.

Typically, students will:

in Design and Technologies

- design and safely make a product, for example, create a musical instrument using recycled materials
- explore how food and clothing are produced and how food can be prepared for healthy eating

in Digital Technologies

- represent data as pictures, symbols and diagrams
- break down a problem into parts and sequence the steps in finding a solution, for example, controlling a toy with digital technologies.

Technologies

Students build on concepts, skills and processes developed in earlier years of Design and Technologies, and Digital Technologies.

Typically, students will:

in Design and Technologies

- draw, label and model ideas when designing and producing solutions such as creating a toy that moves
- plan steps to produce solutions and learn to manage their time

in Digital Technologies

- identify and learn how to follow safety rules when working online
- identify problems and solve them, for example, identifying stages of a game and decisions that a player must make to win
- create a range of digital solutions, such as coding simple interactive games.

Technologies

Students use design processes to produce solutions. They further develop their knowledge and understanding of digital systems and data; they improve their computational thinking.

Typically, students will:

in Design and Technologies

- use materials or technologies when designing, producing and evaluating solutions, for example, a plan for a new kitchen garden
- represent ideas and solutions in a variety of ways, such as sketches and models
- develop plans to complete tasks

in Digital Technologies

- use simple coding to develop and evaluate digital solutions, such as games or quizzes
- act to ensure their personal safety when engaging online
- collect, interpret and manage a range of data, using digital systems.

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Difference between ICT Capabilities and Digital Technologies

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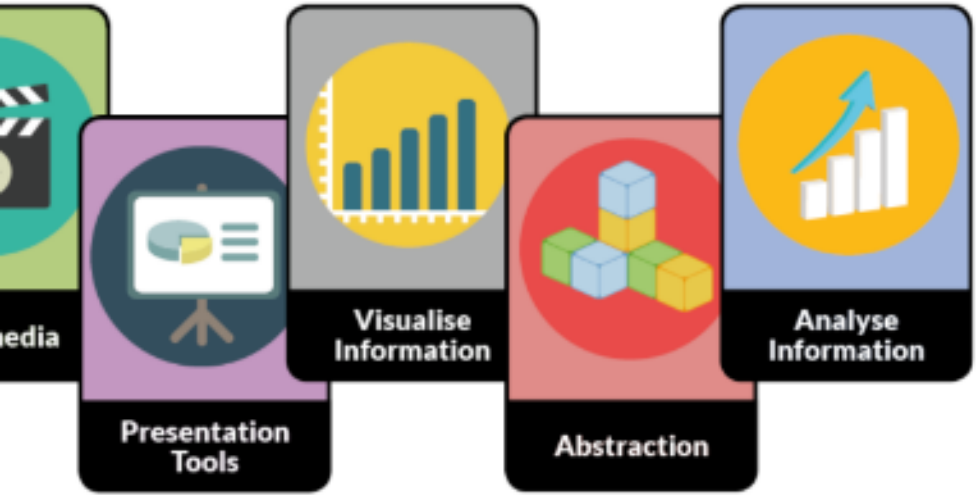
Our curriculum is an opportunity where we are transitioning away from Computing as being a subject to teach students how to use technology and existing applications, towards one where students are taught about how their digital world works and how to create technological solutions.

Developing students' skills in using technology still plays an important role, however, this is characterised as ICT Capabilities in the Australian Curriculum and is something that is developed across all learning areas, when opportunities are arise for students to use ICT's

Attribution: Rebecca Vivian & Katrina Falkner, Computer Science Education Research Group, The University of Adelaide.



Digi Tech vs ICT Capability Card Game

Digital Technologies

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Why learn Digital Technologies?

Digital Technology, is not just about sitting in a room playing with a computer - it is so much more than that. Digital Technology is about changing the world.

The study of digital technology and computational thinking into Australian classrooms ensures that Australian youth move from being users of technology, produced elsewhere, to becoming world leaders in developing new technological innovations and solutions.

Digital technology will become more pervasive as our society evolves and it will be essential for our next generations to understand how technology works, in order to have the best insight into how technology can benefit society and the environment. It's also about understanding how software works so that, in any industry, we can consider the best ways to integrate technology to have the greatest impact.

Attribution: Rebecca Vivian & Katrina Falkner, Computer Science Education Research Group, The University of Adelaide.

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Information Paper

Digital Technologies

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Attribution: Rebecca Vivian & Katrina Falkner, Computer Science Education Research Group, The University of Adelaide.

Thinking Skills

Three fundamental thinking skills are embedded across the Digital Technologies learning area:

- **Systems Thinking**
- **Design Thinking**
- **Computational Thinking**

What is Design Thinking?

DESIGN THINKING is a process that promotes rapid thinking and thinking of alternative solutions to problems. It places a focus on the audience or the user for whom you are designing a solution for.

What is Systems Thinking?

SYSTEMS THINKING is a process that involves understanding that problems can be solved or ideas generated by considering something as a system. It is about considering the bigger picture.

What is Computational Thinking?

COMPUTATIONAL THINKING describes a set of processes and approaches that can be used to solve a problem. This problem-solving process involves a number of characteristics. These include: decomposition, pattern recognition, algorithmic thinking, and abstraction.

Sending secret messages with cryptography

An activity by the Australian Computing Academy

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Achievement Standards

Digital Technologies: Sequence of achievement F-10

Achievement Standard	Foundation to Year 2	Years 3 and 4	Years 5 and 6
	By the end of Year 2, students identify how common digital systems (hardware and software) are used to meet specific purposes. They use digital systems to represent simple patterns in data in different ways. Students design solutions to simple problems using a sequence of steps and decisions. They collect familiar data and display them to convey meaning. They create and organise ideas and information using information systems, and share information in safe online environments.	By the end of Year 4, students describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes. They explain how the same data sets can be represented in different ways. Students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input. They explain how the solutions meet their purposes. They collect and manipulate different data when creating information and digital solutions. They safely use and manage information systems for identified needs using agreed protocols and describe how information systems are used.	By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. They explain how digital systems use whole numbers as a basis for representing a variety of data types. Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.

Digital Technologies

Key Concepts

Digital Systems

networks
hardware
binary
processes data
software

A system that _____ in _____, made up of _____, controlled by _____, and connected to form _____.

Data Representation

symbolically
data
digital systems
by people

How _____ is represented and structured _____ for storage and communication, _____ and in _____.

Data Collection

information
collected
calculated

Numerical, categorical, or structured values _____ or _____ to create _____, e.g. the Census.

Data Interpretation

meaning
visualisation
analysis
extracting
modelling

The process of _____ _____ from data. Methods include _____, statistical _____, and _____.

Specification

requirements
defining
problem
breaking it down

_____ a _____ precisely and clearly, identifying the _____ and _____ into manageable pieces.

Algorithms

decisions
iterative
sequence
steps

The precise _____ of _____ and _____ needed to solve a problem. They often involve _____(repeated) processes.

Implementation

coding
software
computer
automation

The _____ of an algorithm, typically by writing a _____ program (_____) or using appropriate _____.

Impact

predicting
change
analyzing
meet needs

_____ and _____ how existing and created systems _____, affect people, and _____ society and the world.

Interaction

interface
collaborate
communicate
experience

How users _____ and _____ with digital systems, and how we use them to _____ and _____.

Abstraction

details
idea
focus
manageable
solution

Hiding _____ of an _____, problem or _____ that are not relevant, to _____ on a _____ number of aspects.

aca.edu.au

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Digital Technologies

Key Concepts

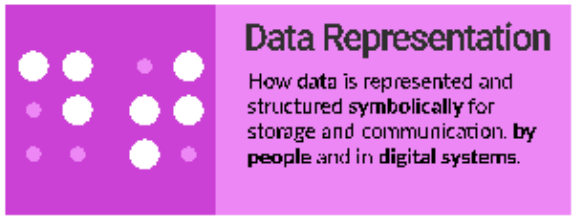
Australian Computing Academy

Digital Technologies resources
aca.edu.au

THE UNIVERSITY OF SYDNEY

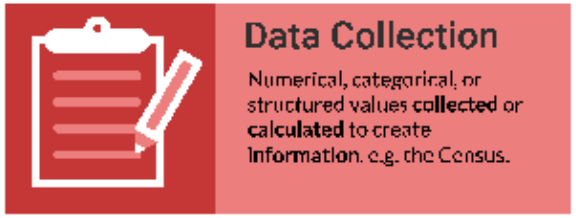
Digital Systems

A system that **processes data in binary**, made up of **hardware**, controlled by **software**, and connected to form **networks**.



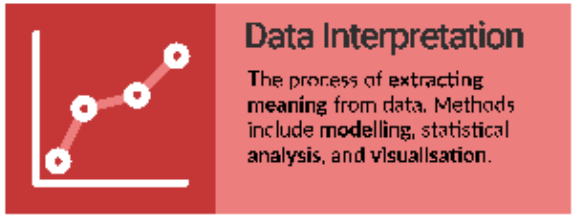
Data Representation

How **data** is represented and structured **symbolically** for storage and communication, **by people** and in **digital systems**.



Data Collection

Numerical, categorical, or structured values **collected** or **calculated** to create **information**, e.g. the Census.

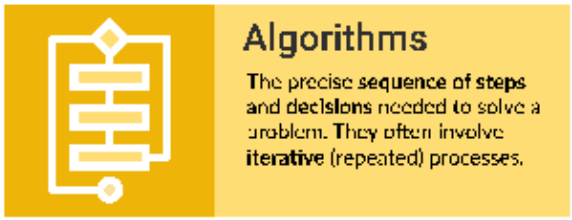


Data Interpretation

The process of **extracting meaning** from data. Methods include **modelling**, statistical **analysis**, and **visualisation**.

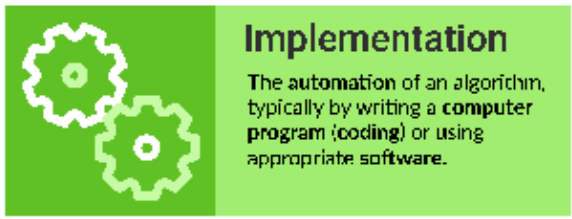
Specification

Defining a problem precisely and clearly, identifying the **requirements**, and **breaking** it **down** into manageable pieces.



Algorithms

The precise **sequence of steps** and **decisions** needed to solve a problem. They often involve **iterative** (repeated) processes.



Implementation

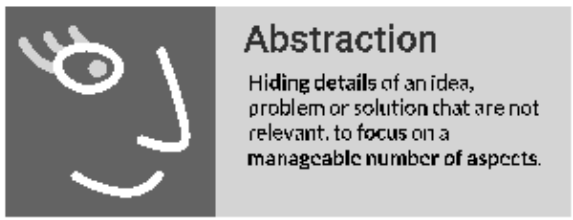
The **automation** of an algorithm, typically by writing a **computer program** (**coding**) or using appropriate **software**.

Impact

Analysing and **predicting** how existing and created systems **meet needs**, **affect** people, and **change** society and the world.

Interaction

How users **experience** and **interface** with digital systems, and how we use them to **communicate** and **collaborate**.



Abstraction

Hiding details of an idea, problem or solution that are not relevant, to **focus** on a **manageable number of aspects**.

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ICT General Capability

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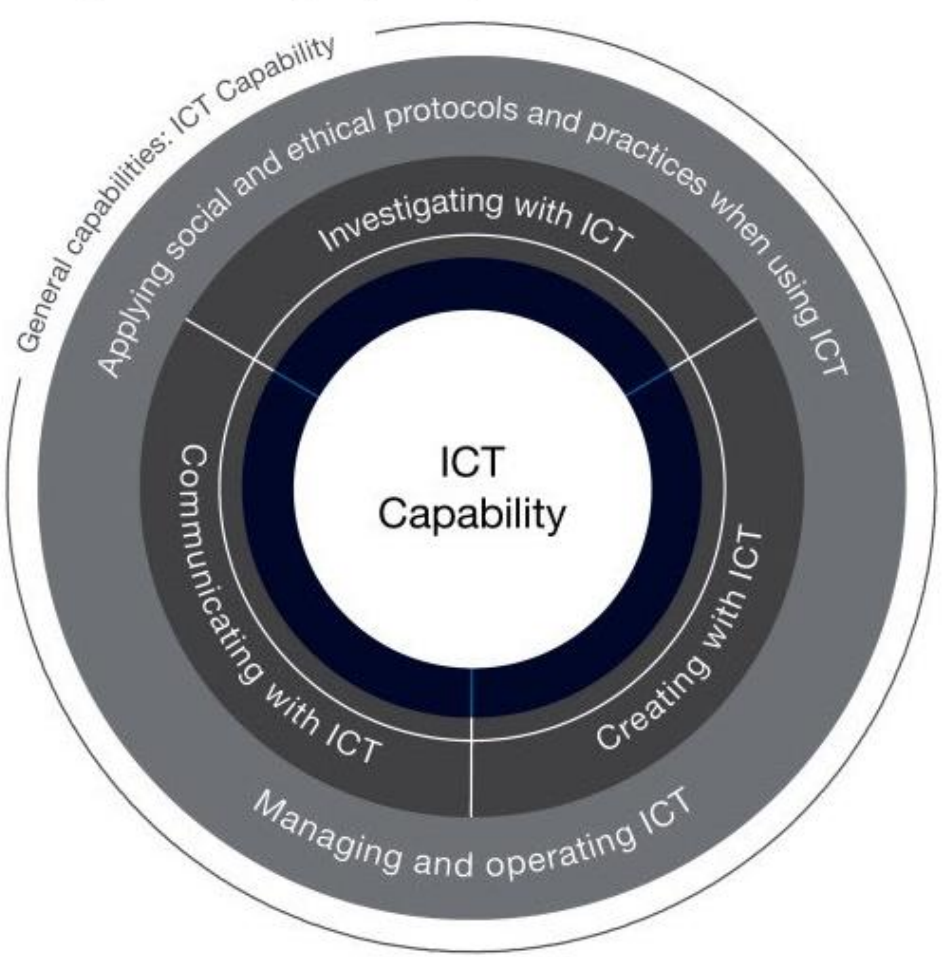
This is our beautiful planet, the Earth.

Key ideas

The key ideas for ICT Capability are organised into five interrelated elements in the learning continuum, as shown in the diagram below.



Organising elements for ICT Capability

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Information and Communication Technology Capability learning continuum

Sub-element	Level 1 Typically, by the end of Foundation Year, students:	Level 2 Typically, by the end of Year 2, students:	Level 3 Typically, by the end of Year 4, students:	Level 4 Typically, by the end of Year 6, students:	Level 5 Typically, by the end of Year 8, students:	Level 6 Typically, by the end of Year 10, students:
Applying social and ethical protocols and practices when using ICT element						
Recognise intellectual property	recognise ownership over their own digital work	recognise ownership of digital products that others produce and that what they create or provide can be used or misused by others	acknowledge when they use digital products created by someone else, and start to indicate the source	identify the legal obligations regarding the ownership and use of digital products and apply some referencing conventions	apply practices that comply with legal obligations regarding the ownership and use of digital products resources	identify and describe ethical dilemmas and consciously apply practices that protect intellectual property
Apply digital information security practices	follow class rules about using digital information	follow class rules about applying selected standard guidelines and techniques to secure digital information	independently apply standard guidelines and techniques for particular digital systems to secure digital information	independently apply strategies for determining and protecting the security of digital information and assess the risks associated with online environments	independently apply strategies for determining the appropriate type of digital information suited to the location of storage and adequate security for online environments	use a range of strategies for securing and protecting information, assess the risks associated with online environments and establish appropriate security strategies and codes of conduct
Apply personal security protocols	follow class rules when sharing personal information with known audiences and demonstrate an awareness of applying social protocols when using ICT to communicate	follow class guidelines when sharing personal information and apply basic social protocols when using ICT to communicate with known audiences	apply standard guidelines and take action to avoid the common dangers to personal security when using ICT and apply appropriate basic social protocols when using ICT to communicate with unknown audiences	identify the risks to identity, privacy and emotional safety for themselves when using ICT and apply generally accepted social protocols when sharing information in online environments, taking into account different social and cultural contexts	identify and value the rights to identity, privacy and emotional safety for themselves and others when using ICT and apply generally accepted social protocols when using ICT to collaborate with local and global communities	independently apply appropriate strategies to protect rights, identity, privacy and emotional safety of others when using ICT, and discriminate between protocols suitable for different communication tools when collaborating with local and global communities
Identify the impacts of ICT in society	identify how they use ICT in multiple ways on multiple devices	identify how ICT is used at home and at school	identify the value and role of ICT use at home and school	explain the main uses of ICT at school, home and in the local community, and recognise its potential positive and negative impacts on their lives	explain the benefits and risks of the use of ICT for particular people in work and home environments	assess the impact of ICT in the workplace and in society, and speculate on its role in the future and how they can influence its use

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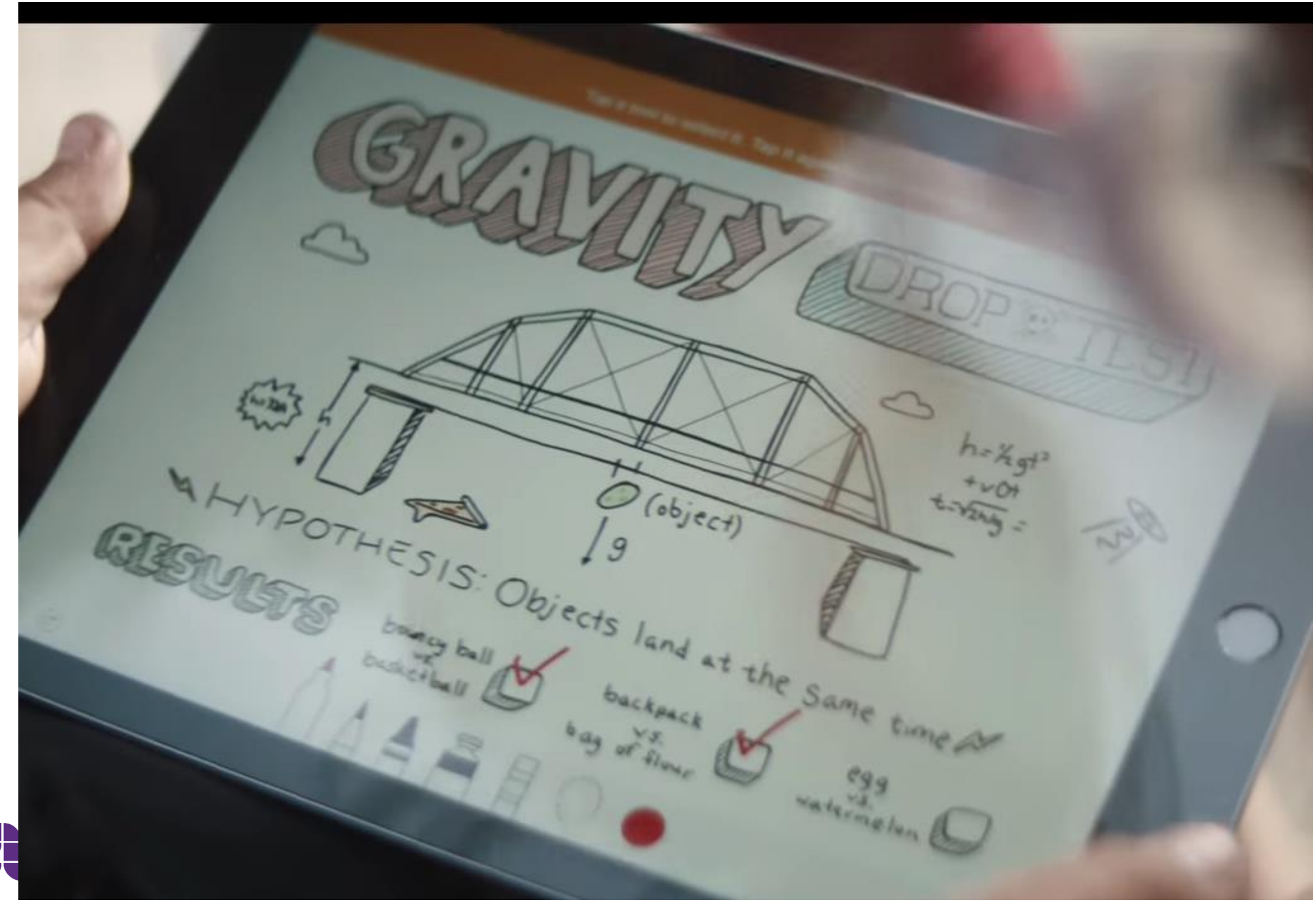
GRAVITY
DROP TEST
(object)
g
HYPOTHESIS: Objects land at the Same time
RESULTS
bouncy ball vs. basketball
backpack vs. bag of flour
egg vs. watermelon


PERFORMANCES
MOTION
FORCE
ENERGY
EDIT PATH
9.8
mph
DISTANCE TRAVELED

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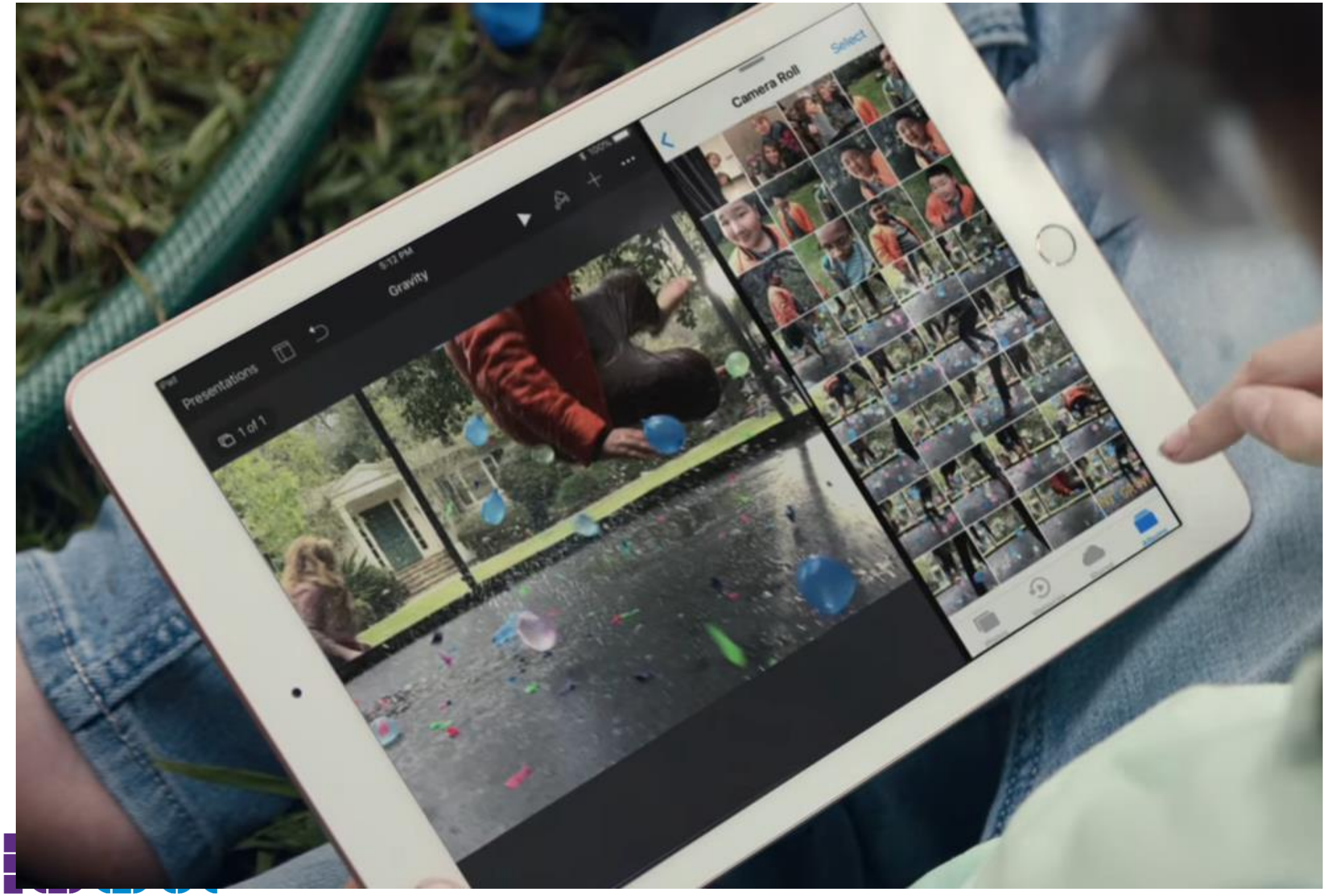
Presentations
1 of 1
Gravity
Photos


Camera Roll
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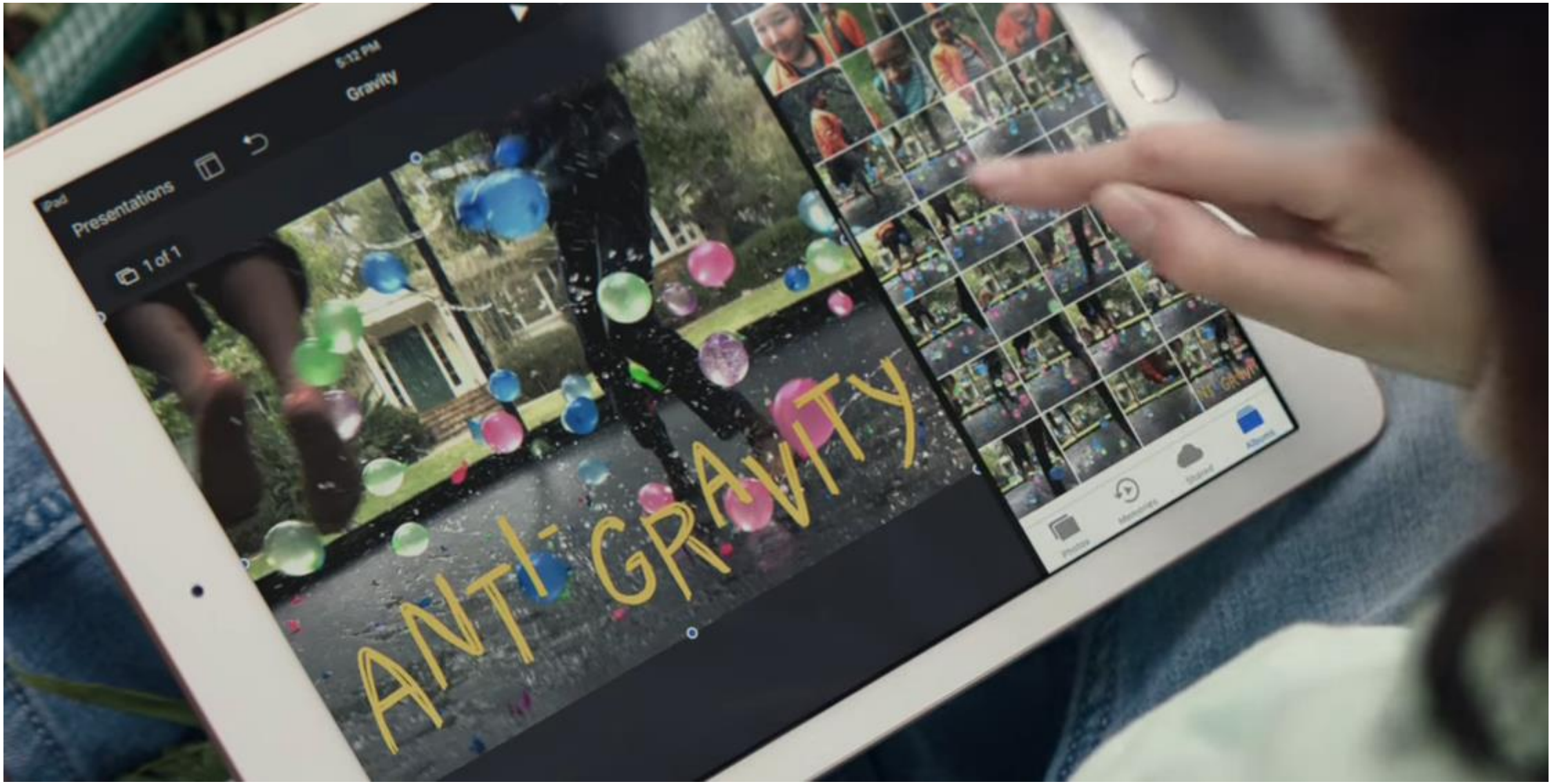
Presentations
1 of 1



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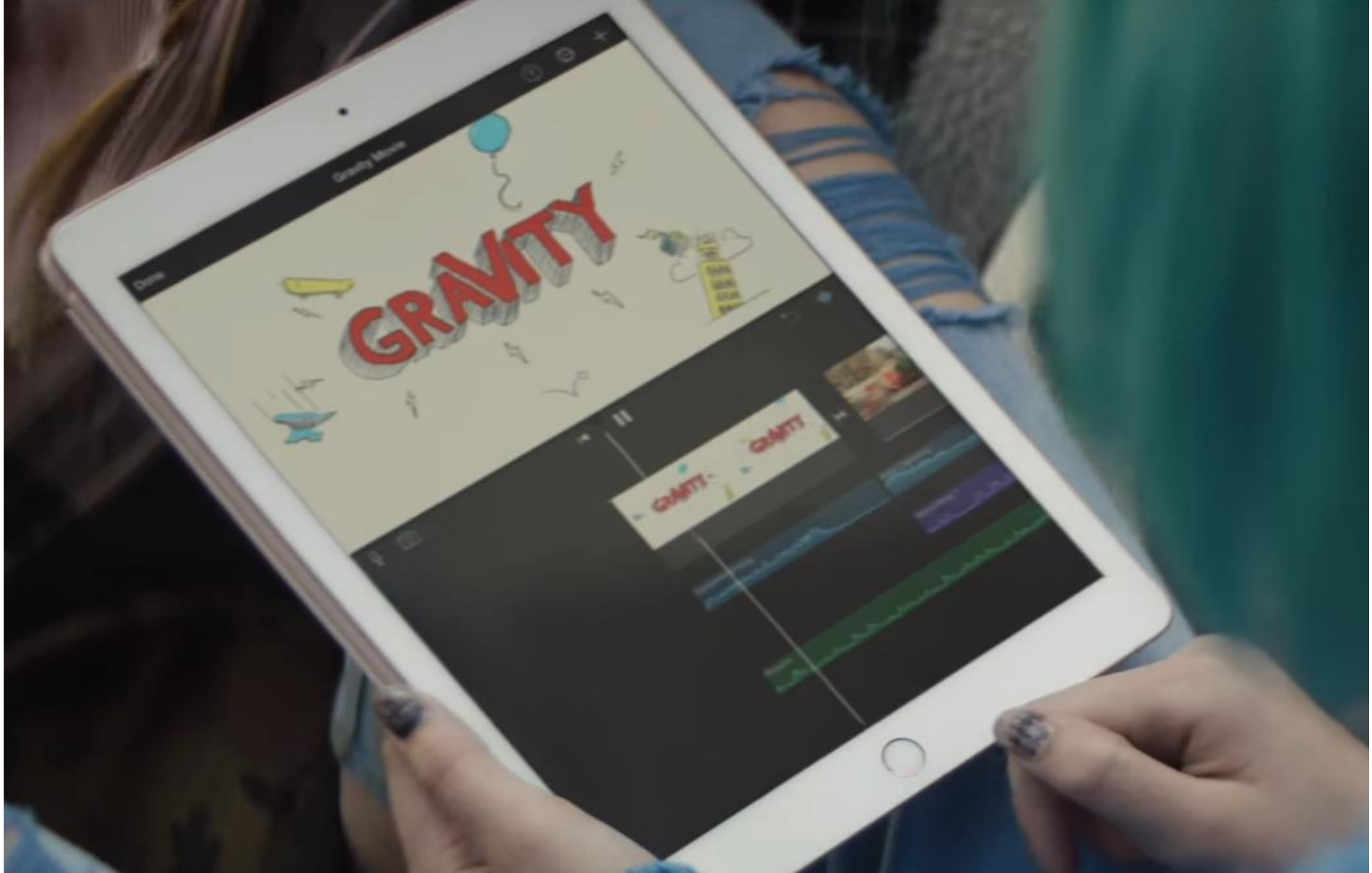
Gravity Movie
GRAVITY

Information and Communication Technology Levels 1-3

Audit Code	
Y	Covered in Current Curriculum
X	Does not exist in Current Curriculum document
E	Exists in current document but needs reworking
D	Exists in current document but at different year level
L	Located in another curriculum area
PL	Needs Professional Learning in the following year(s)
R	Additional Resources required
C	See Comment

Digital Technologies Resources

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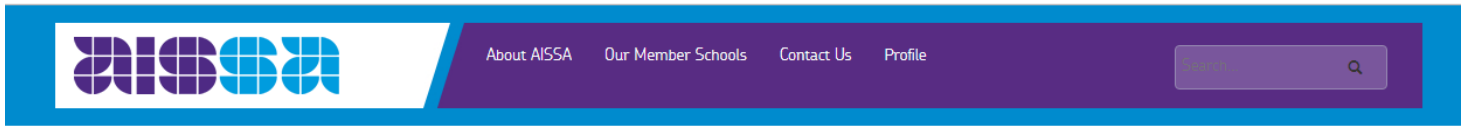

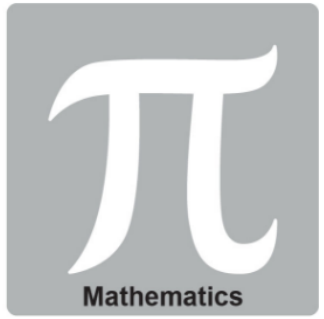

STEM

STEM is a term used to refer collectively to the teaching of the disciplines of Science, Technology, Engineering and Mathematics, and also to a cross-disciplinary approach to teaching which potentially increases student interest in STEM related fields and improves students' problem solving and critical analysis skills. Australia's Chief Scientist has highlighted the need for STEM qualified Australians and a National STEM School Education Strategy has been created to build on the work already underway in schools and universities. STEM skills in the workplace are widely recognised as being crucial to our long term future. This site will support independent schools to explore the opportunities for education, research, and possible approaches to effective Science Technology Engineering and Maths implementation.

STEM Audit Tool

STEM Audit brief
STEM Strategy Blank Template
STEM Strategy Example

Position Papers

Position Paper for SA Independent Schools – Mathematics
AISSA Digital Technologies Information Paper 2018

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Humanoid Robot Research Project

Association of Independent Schools of South Australia

Research

Science
Technology
Engineering
Mathematics
STEM

Resources

Science
Technology
Engineering
Mathematics
STEM

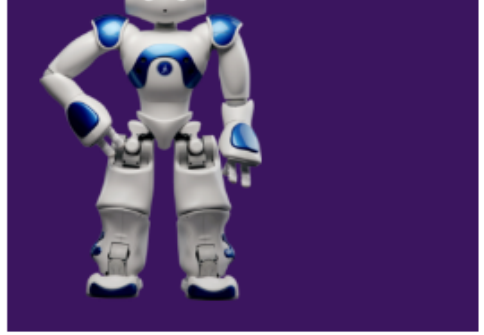
School Stories

Industry and Tertiary Partnerships

Robotics Project

Professional Learning

The free South Australian Institute for Educational Research (SAIER) 2018 Mid-Year Seminar will be taking place on Wednesday, 25 July at 7.00pm. See the flyer for more details and email Juliet Young-Thornton or call (08) 8206 8600 to register.



STEM on Twitter

Tweets by @AISSA_STEM

AISSA STEM Retweeted

Monica Williams
@moons064

Paula Christophersen is one of the writers of the ACARA Digital Technologies subject and will offer great insights at EdTechSA conference in 2 weeks. @tina_p @EdTechSA @AISSA_STEM @KarenSchoff @mary_whittaker @JasonMFay85

Jun 29, 2018

AISSA STEM Retweeted

Embed View on Twitter

CSER Digital Technologies Education

THE UNIVERSITY of ADELAIDE

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@tina_p

. @SATeachLearn @TRB_SA @moons064 @cserAdelaide @DECDTeacherLead @DECD_ECT @Edufolios @EduTweetOz @EdTechSA

1h

CSER Adelaide Retweeted

Anne McIntosh
@mrsamcintosh

STEM challenge session @Ozobot 100cm challenge. Thanks @cserAdelaide for the loan of kit. Students have loved it. #engaged #STEMeducation

CSER F-6 Digital Technologies: Foundations

Digital Technologies involves learning about how we can create new technologies, as well as use them. This course will explain the fundamentals of digital technology and computational thinking specifically addressing the content descriptors and achievement standards of the Australian Curriculum: Digital Technologies (Foundations to 6).

Join us to learn about how digital technology can be integrated into your classroom, exploring example lesson plans, and helping form a community designed to share resources and support!

If it is your first time here, please enrol in the course by clicking the "Register" button below. If you have already registered, you may need to Log-in again by clicking on "Login" in the top, right-hand corner.

Professional Learning Certificate available (mapped to AITSL standards)
Free and open to all

This project receives funding from the Australian Government Department of Education and Training. In addition, the development of this course is supported by:

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Activities Near You Now

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STEM Pack 4 - Bringing Engineering to Life

The aim of each STEM Careers Pack is twofold: first, to make students aware of the wide variety of STEM careers there...

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Australian Computing Academy

Helping teachers implement the Australian Curriculum: Digital Technologies

Unpack the curriculum

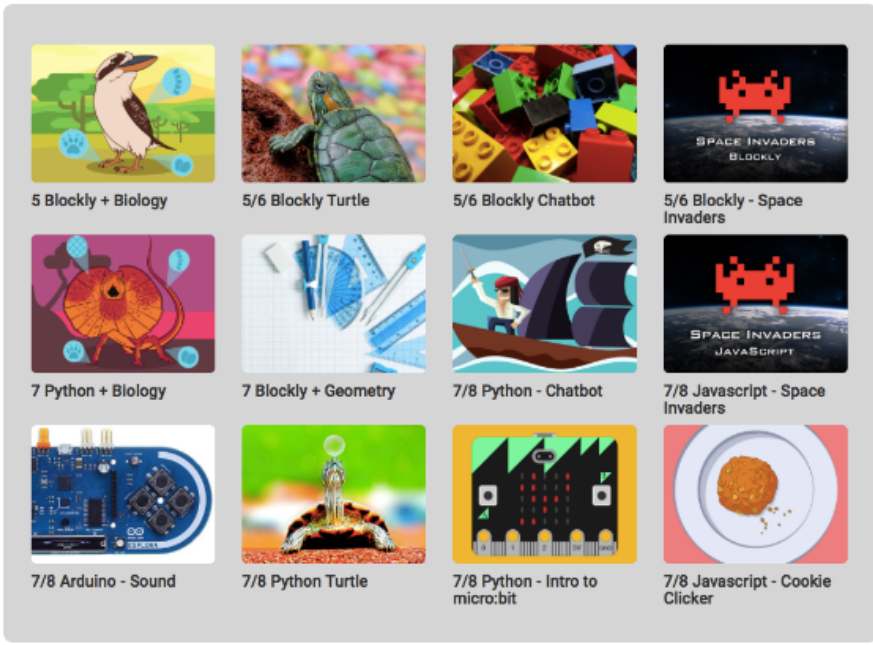
Australian Digital Technologies Challenges

New! Free online access for Years 5 - 8

The *Australian DT Challenges* are free in-classroom activities designed to address the most technically challenging aspects of the Year 5-6 and 7-8 bands of Australian Curriculum: Digital Technologies.

Each Challenge provides online and unplugged learning resources; engaging, authentic, real-world problems; modular lesson plans; and online training and support for teachers.

Years 5 - 8 students have free access to a learning platform that enables self-paced learning with immediate, intelligent feedback.



View all of the Challenges

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Thank you

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