

3D PRINTING IN PRIMARY SCHOOLS PROJECT

FEBRUARY - DECEMBER 2018

**A COLLABORATION BETWEEN THE SOUTH
AUSTRALIAN DEPARTMENT FOR EDUCATION AND
MAKERS EMPIRE**

REPORT PREPARED SEPTEMBER 2019

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EXECUTIVE SUMMARY

147 schools applied to be a part of the project.

100 schools selected by the Department for Education.



100 schools



64 metropolitan schools



36 regional schools



192 teachers complete PD



1000+ students, teachers and community members invited to showcase event



22 face-to-face professional development events



171 Facebook group members



75 units of work developed



14,654 students



203,001 designs created



35 student created learning videos



100% teachers now confident in their abilities to teach STEM subjects

BACKGROUND

The 3D Printing in Primary Schools project is a collaboration between the Department for Education, South Australia and Makers Empire.

The purpose of this report is to provide a synthesis of information, observations and reflections made by the teachers, students and project team during the 2018 3D Printing in Primary Schools project and to provide qualitative information and insights into the outcomes and experiences of teacher and student participants in the project.

The Department for Education STEM Learning Strategy P-12 represents a significant investment in STEM teaching and learning in South Australian schools to ensure students have access to quality STEM teaching, cutting-edge technology and resources. The strategy articulates a vision that young South Australians, through their engagement in STEM learning are able to secure their place as forward thinkers, innovators, entrepreneurs, leaders and shapers of an adaptable, knowledge-based economy and society.

The 3D Printing in Primary Schools project works towards this vision by engaging students in exciting, challenging STEM learning that is connected to their real-world experiences, and helping teachers to develop pedagogical approaches that enable students to combine STEM knowledge with critical, creative and Design Thinking.

An initial trial was undertaken during 2016 which included 20 schools from regional and metropolitan South Australia. Outcomes and learnings from this initial trial were used to inform the planning and activities for the 3D Printing in Primary Schools project which involved 50 schools in 2017.

In 2018, 100 metropolitan and regional schools were involved in the 3D Printing in Primary School project. Half of the schools participated in the project from February to June with the second cohort of schools involved from July to December.

Participants were supported to develop critical, creative thinking learning opportunities using high quality, intentional tools, including Makers Empire 3D design software, and to develop units of work with a STEM focus utilising Design Thinking principles.

A summary snapshot of the outputs of the project can be seen on the adjacent page.

The following learnings from 2016 and 2017 and iterations of this project have been used to inform the planning, iteration and activities for the 3D Printing in Primary Schools project in 2018 and beyond:

- Broaden the professional learning activities to provide additional face-to-face support and to ensure the online component is relevant and accessible to participants;
- Group schools in more geographically local clusters to enable better networking opportunities and ongoing support and for logistical considerations; and
- Provide better guidance in developing school-wide implementation plans and capacity building, including ongoing support, 3D tools and resources, and input from previous project participants.

OBJECTIVES

The project objectives focus on the Australian Curriculum: Technologies, ICT General Capability, the South Australian teaching for Effective Learning framework (TfEL) and South Australian Learning Design, with 3D design and printing as the focal point to spark innovation and creative professional learning in each participating school.

The professional learning program to support the project will be based on three core principles:

1. Building school-wide capacity through development of a comprehensive 3-year school-wide implementation plan;
2. Developing a site implementation plan for the integration of 3D technology; and
3. Provision of high quality intentional 3D technology tools and resources.

Educational Outcomes

- Designing innovative learning programs that provide authentic, meaningful contexts for students to engage in STEM learning.
- Activating the power of 3D technologies to develop and enhance students' critical and creative thinking skills.
- Achieving Design Thinking learning outcomes defined by the Australian Curriculum: Technologies, Design and Technologies in authentic contexts.
- Developing effective pedagogies for integrating 3D technologies across the curriculum.
- Developing innovative teaching and learning programs that enhance educational outcomes for students and provide pathways to 21st century careers.
- Developing and implementing pedagogies based on the TfEL framework that are adapted to today's learners and that leverage technology to enhance learning.
- Foster opportunities for STEM learning across the whole school curriculum.

PROJECT TEAM

Department for Education

Karen Butler: Project Officer, Primary Learners

Catherine Williams: Project Officer, Primary Learning Improvement Priorities

Makers Empire

Mandi Dimitriadis: Director of Learning

Kim Martin: Learning Consultant

Jess McDonald: Manager Customer Success

Luke Tansell: Hardware Specialist

PROJECT ACTIVITY PLAN

Term 4, 2017	Term 1, 2018	Term 2, 2018
Expressions of interest invited	Project teachers from Semester 1 participating schools nominated	2 informal cafe sessions provided (1 metro, 1 regional)
Participating schools selected and notified	2 full day face-to-face professional learning days for all participating teachers	Student and/or teacher created videos submitted
Moodle course developed to provide participants with ongoing support and professional learning content	Information session for school leaders	Student-led showcase event to share and celebrate learning
	Pre-project data collected	Units of work and Learning Design documented and submitted
	Online support provided through Moodle	Post-project data collected
	School visits provided as needed	Capacity building and implementation plans developed by individual schools
	Closed Facebook group professional learning community expanded to include participants from 2017 and 2018 projects	
	Hardware support including site visits offered to all schools	

PROJECT ACTIVITY PLAN

Term 3, 2018	Term 4, 2018	
Project teachers from Semester 2 participating schools nominated	2 informal cafe sessions provided (1 metro, 1 regional)	
2 Full Day face-to-face professional learning days for all participating teachers	Student and/or teacher created videos submitted	
Information session for school leaders	Student-led showcase event to share and celebrate learning	
Pre-project data collected	Units of work and Learning Design documented and submitted	
Online support provided through Moodle	Post-project data collected	
School visits provided as needed	Capacity building and implementation plans developed by individual schools	
Participants join closed Facebook group	Final project report prepared	
Hardware support including site visits offered to all schools		

PROFESSIONAL LEARNING DELIVERY MODES

Participants engaged in Makers Empire's Learning by Design professional learning course.

Based on best practice for effective professional learning models, the professional learning program is offered as a blend of three types of learning, experiential, social and formal. The program was tailored to meet the learning needs of participants. The face-to-face sessions were well received by participants with strong attendance at these sessions. This eleven included initial face-to-face professional learning days and eleven follow up days for planning and collaboration.

The follow up face-to-face days have been a new addition to the 2018 project and allowed participants to regroup 2-3 weeks after the initial professional development days, share ideas, design learning experiences, plan collaboratively and develop proficiency with software and hardware.

Statewide Showcase events were held on Thursday July 5th and Monday December 3rd, with a regional Showcase event held at Port Augusta on Monday November 26th for all participants and their students to share and communicate their learning in an expo style environment.

During the 2017 project it was noted that the weekly online support sessions were the least attended opportunity provided as part of this project. In response to this, a Moodle course was developed to provide continuous access to resources, support and professional learning content addressing maker pedagogy, Design Thinking and 3D printing. Although all project participants accessed the Moodle initially, activity levels dropped off significantly as the project progressed.

A closed Facebook group, established for the project in 2017, was expanded to include 2018 participants. This group serves as a key communication platform for sharing ideas, discussion and asking questions of colleagues and for accessing resources at suitable times. For example, a number of teachers shared their ideas for the units of work they are developing and uploaded photographs of their students engaged in various phases of the Design Thinking process. This Facebook group has 171 total members and showed steady levels of activity during key stages of the project.

PROJECT EXPECTATIONS

The joint ACARA and AAMT 2014–2015 STEM Connection action research project highlighted the effectiveness of using an integrated approach in the teaching and learning of the STEM disciplines. The first phase of the 2018 3D Printing in Primary Schools project is based on this approach by supporting 45 schools and 111 educators and leaders to develop an integrated 3D design and printing project that had its basis in the real-world and incorporated the Australian Curriculum learning areas, focusing on technologies, science, mathematics and ICT as a general capability.

Educators and leaders from participating schools have been engaged in face-to-face and online professional learning and support addressing:

- Constructionism and the big ideas of maker pedagogy
- Design Thinking
- Critical and Creative thinking and the ICT general capabilities
- Australian Curriculum: Technologies, specifically Design and Technology
- Using Makers Empire 3D modelling software
- Understanding 3D design and printing within a learning context
- Embedding learning technologies across the curriculum
- Improving student engagement in STEM learning.

Expectations for participating educators:

- Attendance at all face-to-face professional learning activities, consisting two full days with Makers Empire's Learning Team (by negotiation with small schools where this might cause overt disruption)
- Participation in online face-to-face professional learning communities (Moodle and/or Facebook group)
- Design, trial and documentation of a unit of work or learning plan for publication that uses 3D modelling and design aligned to TfEL, Learning Design principles and the Australian Curriculum.
- Participation in a student-led Showcase Event to share and celebrate learning from the project.
- Collection of pre- and post- project data with their students and as participants in the project.

Expectations for participating school sites:

- Identify and provide release (approximately three days) for a minimum of two participating classroom teachers or teams of teachers. Involvement of IT technicians and school leaders is welcomed but not considered as teacher participation, except in the case of small schools where leaders have significant teaching components.
- Support capacity building of classroom teachers through the facilitation of 'flow-on' professional learning within their sites, through new or existing professional learning structures so that whole site professional learning can occur.
- Facilitate the conditions under which participating teachers can design, trial and document a unit of work or learning plan for publication that uses 3D modelling and design align with TfEL, Learning Design principles and the Australian Curriculum.
- Facilitate the conditions under which data collection can occur.

PROJECT IMPLEMENTATION

STAGE ONE

- The project plan was approved by the Department for Education in October 2017.
- Department for Education and Makers Empire project teams were identified and implementation planning was conducted collaboratively.
- Schools were invited to submit expressions of interest to be involved in the project in a circular sent to all Department for Education schools with primary enrollments by November 29th 2017
- Schools were asked to explain how participation in the project would contribute to their site's focus on improving STEM teaching and learning, and were required to have their expression of interest endorsed by their Education Director.
- 147 expressions of interest were received.
- Department for Education team members conducted selection process based on advertised criteria and 100 successful schools were notified of their inclusion in the project on December 5th, 2017.
- The 100 selected schools were divided into 2 project groups for 2018 (45 in Semester 1 and 55 in Semester 2)
- The selected schools represent 44 Department for Education Local Partnerships and were grouped to allow for geographical proximity.
- Makers Empire product keys were created, giving all 100 schools a 12-month subscription to Makers Empire 3D Learning Program.

SEMESTER 1

PARTICIPANT SCHOOLS

SCHOOL	# TEACHERS	REGION	The Department for Education LOCAL PARTNERSHIP
GR001	2	Gawler 2/Riverland	Renmark Loxton
MB001	2	Murray Bridge 2	Murraylands
MB002	2	Murray Bridge 2	Murraylands
MB003	2	Murray Bridge 2	Murraylands
MB004	2	Murray Bridge 2	Murraylands
MB005	2	Murray Bridge 2	Murraylands
MTG001	2	Mt Gambier 1	Tatiara-Wrattonbully 1
FP011	3	Flinders Park 4	West Torrens
FEL001	2	Felixstow 1	Adelaide Prospect
FP001	3	Flinders Park 3	Western Adelaide Shores
FP002	2	Flinders Park 3	Western Adelaide Shores
FP003	2	Flinders Park 4	Inner West
FP004	2	Flinders Park 4	Inner West
FP005	2	Flinders Park 4	Inner West
FP006	2	Flinders Park 2	Le Fevre Peninsula
FP007	2	Flinders Park 3	Holdfast
FP008	2	Flinders Park 3	Holdfast
FP009	4	Flinders Park 2	West Torrens
FP010	2	Flinders Park 2	West Torrens
FP012	2	Flinders Park 2	West Torrens
FP013	2	Flinders Park 4	Torrens
FP014	2	Flinders Park 4	Torrens
FP015	2	Flinders Park 4	Torrens
NOA001	2	Noarlunga 4	Fleurieu
NOA002	2	Noarlunga 4	Fleurieu
NOA003	2	Noarlunga 4	Fleurieu
NOA004	2	Noarlunga 4	Fleurieu
NOA005	2	Noarlunga 4	Fleurieu
MTB001	3	Mt Barker 2	Mitcham Hills
MTB002	2	Mt Barker 2	Mitcham Hills
MTB003	2	Mt Barker 2	Mitcham Hills
MTB004	2	Mt Barker 2	Mitcham Plains
MTB005	2	Mt Barker 2	Mitcham Plains
NOA006	2	Noarlunga 3	Beach Road
NOA007	2	Noarlunga 1	Marion Inland

NOA008	2	Noarlunga 1	Marion Inland
NOA009	3	Noarlunga 1	South Valley Precinct
NOA010	2	Noarlunga 2	Marion Coast
NOA011	2	Noarlunga 2	Panalatinga
NOA012	3	Noarlunga 2	Panalatinga
NOA013	2	Noarlunga 2	Panalatinga
NOA014	2	Noarlunga 2	Panalatinga
NOA015	2	Noarlunga 2	Panalatinga
NOA016	2	Noarlunga 2	Panalatinga
NOA017	6	Noarlunga 1	Kangaroo Island

SEMESTER 2 PARTICIPATING SCHOOLS

SCHOOL	# TEACHERS	REGION	The Department for Education LOCAL PARTNERSHIP
FEL002	2	Felixstow 2	Campbell
Felixstow Community School	2	Felixstow 2	Campbell
FEL005	2	Felixstow 1	Greenhill South
FEL006	2	Felixstow 1	Greenhill South
FEL007	2	Felixstow 2	Morialta
FEL010	3	Felixstow 1	Central East
FEL003	2	Felixstow 2	Campbell
FEL008	2	Felixstow 2	Morialta
FEL004	2	Felixstow 2	Campbell
FEL009	2	Felixstow 2	Morialta
KA001	2	Kadina 1	Southern Yorke
GA001	2	Gawler 3	Mid North Clare
GA002	2	Gawler 3	Mid North Clare
GA003	2	Gawler 3	Mid North Clare
GA004	2	Gawler 3	Mid North Clare
GA007	2	Gawler 3	Lower Mid North
KA002	2	Kadina 1	Southern Yorke
GA009	2	Gawler 3	Lower Mid North
GA010	2	Gawler 1	Goyder and Light
GA008	2	Gawler 3	Lower Mid North
KA004	2	Kadina 1	Southern Yorke
KA005	2	Kadina 1	Southern Yorke
GA005	2	Gawler 3	Mid North Clare
KA006	2	Kadina 1	Southern Yorke
GR002	2	Gawler 2/Riverland	Renmark Loxton
MTB006	2	Mt Barker 1	Mount Lofty
MTB012	2	Mt Barker 1	Heysen
MTB007	2	Mt Barker 1	Mount Lofty
MTB008	2	Mt Barker 1	Mount Lofty
MTB013	2	Mt Barker 1	Heysen
MTB014	2	Mt Barker 1	Heysen
MTB015	2	Mt Barker 1	Heysen

MTB016	3	Mt Barker 1	Heysen
MTB009	2	Mt Barker 1	Mount Lofty
MTB010	2	Mt Barker 1	Mount Lofty
MTB011	2	Mt Barker 1	Mount Lofty
<i>Withdrew</i>	2	Para Hills 1	Elizabeth
PH003	2	Para Hills 4	Torrens Valley
PH004	2	Para Hills 2	Peachey
PH005	2	Para Hills 1	Hollywood Lakes and Gardens
PH007	2	Para Hills 1	Elizabeth
PH002	2	Para Hills 4	Torrens Valley
PH008	2	Para Hills 2	Salisbury
PH006	2	Para Hills 1	Hollywood Lakes and Gardens
FEL011	2	Felixstow 2	Modbury
PH001	2	Para Hills 4	Torrens Valley
FEL012	2	Felixstow 3	Tea Tree Gully
PA001	2	Port Augusta 1	Far North
PA002	2	Port Augusta 1	Far North
PA003	2	Port Augusta 1	Far North
PA004	2	Port Augusta 1	Far North
<i>Withdrew</i>	2	Pt Lincoln 1	Central Eyre 1
PTL002	2	Pt Lincoln 1	Central Eyre 1
PTL001	2	Pt Lincoln 2	Far West
PTL003	2	Pt Lincoln 1	Central Eyre 1

STAGE TWO

Face-to-face Professional Learning Days

- Initial face-to-face professional learning days were planned to launch the project.
- It was decided to repeat the face-to-face day five times to allow participants all regions to attend.
- The face-to-face professional learning days were jointly planned and facilitated by Department for Education and Makers Empire project teams
- The professional learning program for the face-to-face day was designed as blend of information and pedagogical content, interaction and professional dialogue and hands-on experiential learning.
- The program for the day included:
 - Introduction to constructionist learning theory
 - Unpacking the eight big ideas of maker pedagogy
 - Introduction to Design Thinking principles and strategies
 - What is 3D printing?
 - Current and emerging applications of 3D printing
 - Potential benefits for embedding 3D technologies in teaching and learning for primary schools
 - Familiarisation with Makers Empire 3D modelling software and Teachers Dashboard
 - Australian Curriculum focus
 - TfEL focus
 - Project planning (scope of project, expectations, timelines, data collection)
- Please note, that *Withdrew01* submitted an expression of interest and were successful in being selected for the project. Due to a change in leadership and priority focus, they chose not to participate in the 3D Primary Schools Project. Their position was offered to FP001, whose expression of interest had not previously been selected.
- Please note, that *Withdrew02* submitted an expression of interest and were successful in being selected for the project. Due to a change in leadership and priority focus, they chose not to participate in the 3D Primary Schools Project. Their position was offered to PA004, whose expression of interest had not previously been selected. PA004 were added to the Semester Two cohort to allow them to join other Far West schools.
- Please note, that GR002 submitted an expression of interest and were successful in being selected for the project. Two teachers from this school attended the introductory professional learning day. The school withdrew from the 3D Printing in Primary Schools project shortly after the professional learning day due to conflicting commitments at site level. GR002 rejoined the project in Semester Two.
- The Semester One program therefore commenced with 45 schools and 55 due to begin in Semester Two.
- The face-to-face professional learning days were well attended, with participants from all 45 semester one schools represented.

- A separate session within the program was allocated to providing information to principals and other site leaders. Leaders from all 45 schools either attended the session or made alternative arrangements to collect the information
- Feedback collected from the days, indicated that participants found the day useful and positive:

“This day has inspired me to get started with my students. I can’t wait to see what they come up with- I’m sure they will catch on to designing much quicker than me!”

“I was pleasantly surprised that the PD wasn’t just about 3D printing. The maker pedagogy focus fits really well with our school STEM focus and this new learning has been really useful”

“Thank you for helping us see how everything ties in with TfEL and the Australian Curriculum”

- All participating teachers completed an online pre-project survey to collect baseline data on teacher confidence and skill level with STEM based learning, the Technologies curriculum, maker pedagogy, 3D technologies and Design Thinking.

Follow up Professional Learning Day

- In response to feedback and experiences from the 2017 project, it was decided to provide an additional face-to-face professional learning day as part of the 2018 project.
- The follow up professional learning days were held 3-4 weeks after the initial face-to-face days to allow participating teachers time to process new learning and begin preliminary planning for the project.
- Content for the follow up professional learning days included:
 - Inspiration stories from 2017 project participants
 - Collaborative planning and sharing of ideas
 - Support with developing units of work using the TfEL Learning Design principles
 - Developing skills and proficiencies in using Makers Empire 3D modelling software
 - Developing skills and knowledge using 3D printing hardware
 - Preparation and setting up for the project, including the use of the Makers Empire Teacher Dashboard
- The follow up face-to-face professional learning days were well attended, with participants from all 45 Semester One schools and all 54 Semester Two schools represented. ICT support staff and technicians from 32 of the schools also attended to support hardware and software set-up and operations.
- Additional support including site visits was offered where schools required additional support, such as:
 - Individualised support for a teacher at FP011 who visited the Maker’s Empire office in the school holidays
 - Staff meeting session at NOA004 which was also attended by teachers from NOA005 and Goolwa NOA002.
- All schools with 3D printers, either purchased through Makers Empire or through other providers, were given individualised training support from Makers Empire’s hardware specialist.
- Due to challenges with distance and travel, the Maker’s Empire and DECD project team traveled to Kangaroo Island and delivered the 2 day face-to-face professional learning program at Kingscote. Teachers from 3 participating Kangaroo Island schools attended.

Facebook Professional Learning Community

- The closed Facebook group has 171 members and is being actively used as the project progresses.
- Teachers from the 2017 project continue to belong to this group, which has added to its value as a supportive professional learning community
- The group is being used to ask questions, share resources, share examples and photographs and to discuss different strategies for using 3D technologies in teaching and learning

Moodle Professional Learning Course

- A professional learning course, developed by the Makers Empire learning team, has been made available to all participants through the TLS Moodle. This course offers dynamic and continuous new content and support which all participants have accessed.
- Specific data about participation in the Moodle course will be included in the final project report.
- Content addressed in the Moodle course includes:
 - 3D printing
 - Makers Empire software
 - Teachers Dashboard
 - 3D printing at school
 - Maker pedagogy
 - Design Thinking
 - Project information
 - Work samples

Professional Learning Days: Semester One				
Date	Time	Number of Schools	Venue	Event
February 26th 2018	10.00am-4.00pm	11	Morphett Vale East Primary School	Introductory Professional Learning Day
February 27th 2018	10.00am-4.00pm	16	Maxima Training Centre	Introductory Professional Learning Day
March 1st 2018	10.00am-4.00pm	10	Eastern Fleurieu School F-6	Introductory Professional Learning Day
March 2nd 2018	10.00am-4.00pm	8	Murray Bridge North Primary School	Introductory Professional Learning Day
March 5th 2018	10.00am-4.00pm	1 (3 campuses)	Kangaroo Island Community Education-Kingscote campus	Introductory Professional Learning Day
March 6th 2018	10.00am-4.00pm	1 (3 campuses)	Kangaroo Island Community Education-Kingscote campus	Follow Up Professional Learning Day
March 20th 2018	10.00am-4.00pm	8	Murray Bridge North Primary School	Follow Up Professional Learning Day
March 22nd, 2018	10.00am-4.00pm	16	Education Development Centre	Follow Up Professional Learning Day
March 23rd 2018	10.00am-4.00pm	10	Eastern Fleurieu School F-6	Follow Up Professional Learning Day
April 9th 2018	10.00am-4.00pm	11	Morphett Vale East Primary School	Follow Up Professional Learning Day

Professional Learning Days: Semester Two				
Date	Time	Number of Schools	Venue	Event
July 30th 2018	9.30am-2.30pm	8	Port Augusta Education Office	Introductory Professional Learning Day
August 1st 2018	10.00am-4.00pm	21	The Science Exchange	Introductory Professional Learning Day
August 2nd 2018	10.00am-4.00pm	11	Modbury P-7 School	Introductory Professional Learning Day
August 6th 2018	10.00am-4.00pm	11	Auburn Primary School	Introductory Professional Learning Day
August 7th 2018	10.00am-4.00pm	16	Curramulka Primary School	Introductory Professional Learning Day
August 27th	9.00am-2.00pm	8	Port Augusta Education Office	Follow Up Professional Learning Day
August 29th 2018	10.00am-4.00pm	21	The Science Exchange	Follow Up Professional Learning Day
August 30th 2018	10.00am-4.00pm	11	Auburn Primary School	Follow Up Professional Learning Day

STAGE THREE

Learning Videos

- Makers Empire invited participating teachers and students to document their learning experiences as a short video.
- These videos were created by either students and/or teachers to document teacher and/or student learning as part of the 3D Printing in Primary Schools project.
- The videos could be presented in any format, needed to be between 2-3 minutes in length and needed to communicate learning in an engaging and creative manner.
- Makers Empire offered prizes for the videos that best meet this criteria
- Videos were screened and prizes announced at the showcase events.

Semester 1 Videos		
School	Video	Award
FP013	BUBBLE WAND MATES	
NOA001	PASSWORD REMINDERS	
MTB002	WATER GARDEN DESIGNS	
NOA013	SHARK TANK	People's Choice
FP006	ASSEMBLY MASCOTS	
NOA004	SAND ON BASKETBALL COURT	
FEL001	ACCESSIBLE PLAYGROUND	
NOA015	GROUNDS PERSON'S PHONE	Runner Up
FP005	SOLUTIONS 4 ELDERLY	Winner
FP005	SEALION ENCLOSURES	
FP002	VEGGIE PATCH & RECYCLING	
FP011	DOLL HOUSE FAMILY	
NOA008	INDIVIDUAL PROJECTS	
NOA012	WEARING HATS PROBLEM	

Semester 2 Videos		
School	Video	Award
KA003	Owls Nesting Box	
MTB012	Hats and Jumpers	
PH004	Hungry Birds	
GA004	Print with Purpose	
PH008	Backpacks for SA Kids	
PA001	Life on Another Planet	
PTL003	The Forgotten Pencils	
FEL010	Makers Empire to the Rescue!	
GA003	Amalgamation Creation	
MTB013	Will's Story	Winner
PH003	Storage Solutions	
PH003	Reading Games	
GA009	Helping Farmers in a Drought	
GA010	Matt's Project	Runner up
FEL005	New Playground	
PH006	Working with the Community	
PH007	Saving Water	Runner Up
MTB006	3D Printing Project	

Showcase Events

- Major Showcase events were held for Semester 1 participants on Thursday July 5th and Semester 2 participants on Monday December 3rd.
- An additional Showcase event was held in Port Augusta on Monday November 26th to allow easier access for rural and remote schools in the far west and far north regions.
- The Showcase events were held at:
 - Adelaide Convention Centre on Thursday July 5th
 - Australia Arid Lands Botanic Gardens, Port Augusta on Monday November 26th
 - Royal Adelaide Showgrounds on Monday December 3rd
- In 2017, multiple showcase events were held around the state to allow regional schools to attend with minimum travel time and expense. In response to feedback and experience in 2017, it was decided that the 2018 projects would only have one showcase event per semester but regional schools would be supported to attend. This decision was made to ensure that regional schools could receive the full benefit from attending the day and sharing learning with the statewide cohort. This was with the exception of the smaller Showcase event that was added in negotiation with participants after the project commenced.
- The agenda for the showcase event included an expo-style sharing of student work, with students from each school setting up and facilitating a display booth, presentation of learning videos, reflections and celebration of the project.
- Community attendance at the showcase events was encouraged.

Teachers were asked to complete a pre and post-project survey to measure the impact of the project on teacher confidence and pedagogical change. (see appendix)

Participating teachers documented units of work and TfEL Learning Design templates, using the Makers Empire lesson builder. These units of work will be published and made available to all Department for Education teachers.

SUMMARY OF PARTICIPATION IN PROJECT

SEMESTER 1

School	Introductory Professional Learning Day	Follow Up Professional Learning Day	Moodle Enrolment	Facebook Group
GR001	2	2	2	2
MB001	2	2	2	2
MB002	2	2	2	2
MB003	3	3	2	1
MB004	2	2	2	2
MB005	1	1	1	1
MTG001	3	2	2	2
FEL001	3	2	2	1
FP001	2	2	2	1
FP002	3	2	3	2
FP003	2	2	2	2
FP004	2	2	2	1
FP005	2	2	2	2
FP006	2	2	2	2
FP007	2	2	2	1
FP008	2	2	2	1
FP009	2	2	2	1
FP010	4	3	3	1
FP011	2	2	2	2
FP012	2	2	2	2
FP013	2	2	2	3
FP014	2	2	2	2
FP015	2	2	2	0
NOA001	2	2	2	1
NOA002	2	2	2	1
NOA003	2	2	2	1
NOA004	2	2	2	2
NOA005	2	2	2	2
MTB001	3	3	3	2

MTB002	2	2	2	2
MTB003	2	2	2	1
MTB004	3	2	2	1
MTB005	2	2	2	0
NOA006	2	2	2	1
NOA007	2	2	2	0
NOA008	1	2	3	0
NOA009	3	2	2	2
NOA010	3	1	2	1
NOA011	2	2	2	1
NOA012	4	4	2	2
NOA013	3	2	2	2
NOA014	2	2	2	1
NOA015	3	2	2	1
NOA016	3	3	3	3
NOA017	7	6	6	2

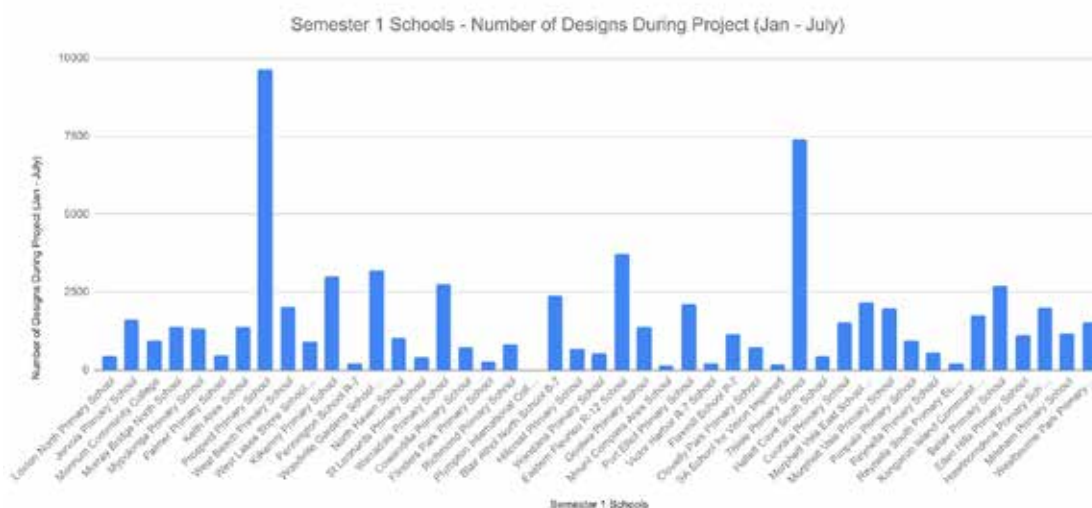
SEMESTER 2

School	Introductory Professional Learning Day	Follow Up Professional Learning Day	Moodle Enrolment	Facebook Group
FEL002	4	4	2	4
FEL003	2	2	2	1
FEL004	2	2	2	2
FEL005	2	2	3	2
FEL006	1	1	3	1
FEL007	2	2	4	2
FEL008	2	2	3	2
FEL009	2	2	3	1
FEL010	2	2	3	2
KA001	2	1	3	2
KA002	2	2	3	2
KA003	2	2	2	2
KA004	1	1	1	1
KA005	1	1	2	1
KA006	1	1	2	1
GA001	2	2	3	2
GA002	2	1	3	2
GA003	2	1	2	1
GA004	2	2	3	2
GA005	3	2	3	2
GA007	2	1	2	0

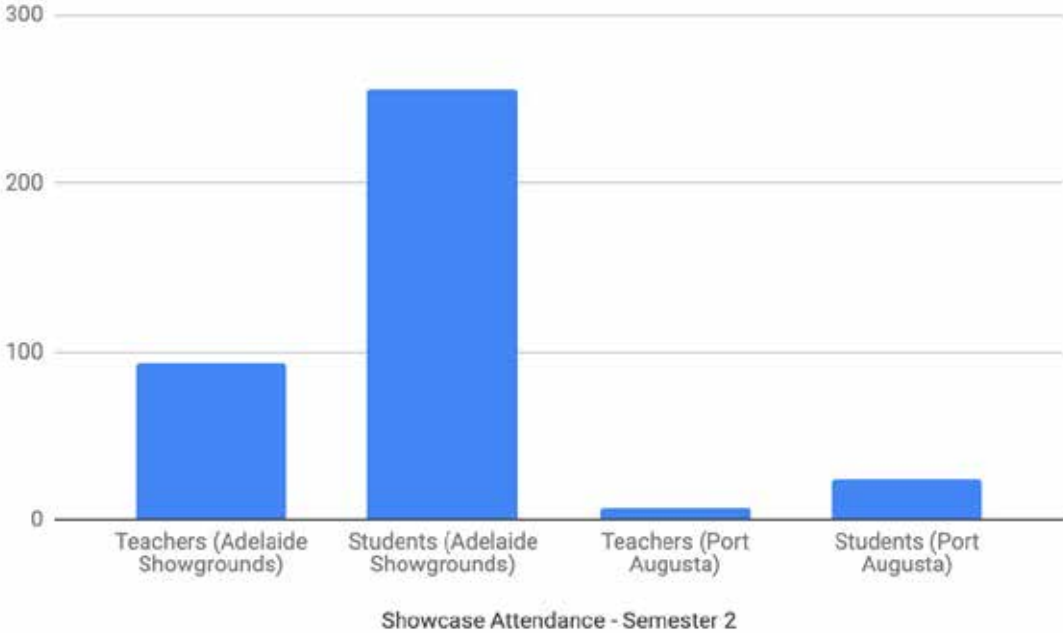
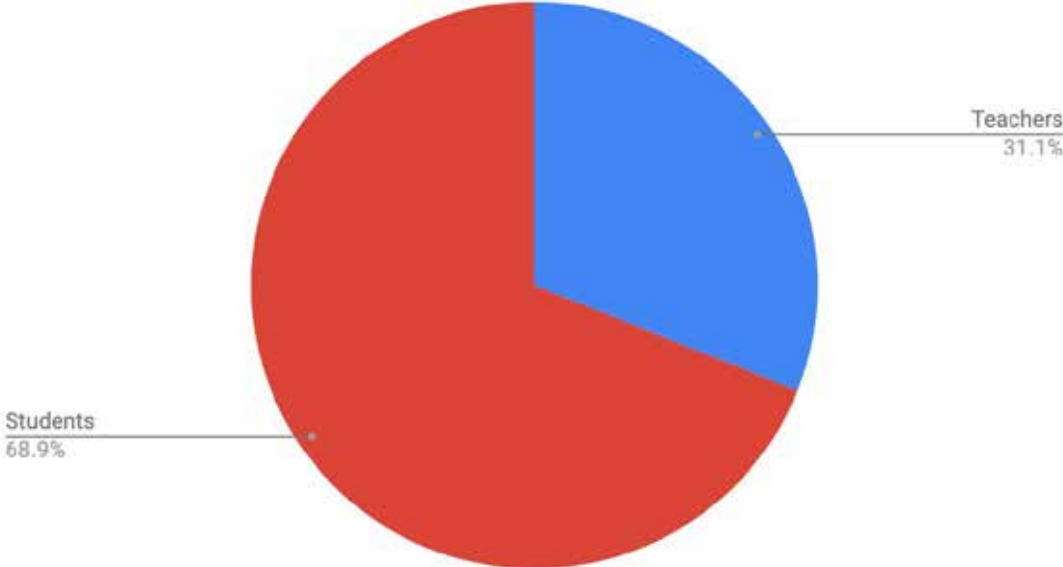
GA008	1	2	2	0
GA009	1	1	3	1
GA006	2	2	2	1
GA010	2	2	3	2
GR002	2	2	3	2
MTB006	2	1	2	2
MTB007	1	1	2	1
MTB008	2	1	3	0
MTB009	1	1	2	1
MTB010	2	2	3	1
MTB011	2	2	3	2
MTB012	2	3	3	2
MTB013	2	2	3	2
MTB014	3	2	3	3
MTB015	2	2	2	1
MTB016	2	2	3	2
PH003	2	2	3	2
PH002	2	1	2	0
PH001	2	2	3	2
PH004	3	3	3	3
PH007	1	2	3	2
PH005	2	2	3	2
PH006	2	2	3	2
FEL011	2	2	3	2
FEL012	2	2	3	1
PA001	2	2	3	2
PA002	1	1	2	0
PA003	1	1	2	0
PA004	1	1	2	0
PTL002	2	1	3	2
PTL003	1	2	3	1
PTL001	2	1	3	0

SUMMARY OF PROJECT OUTCOMES

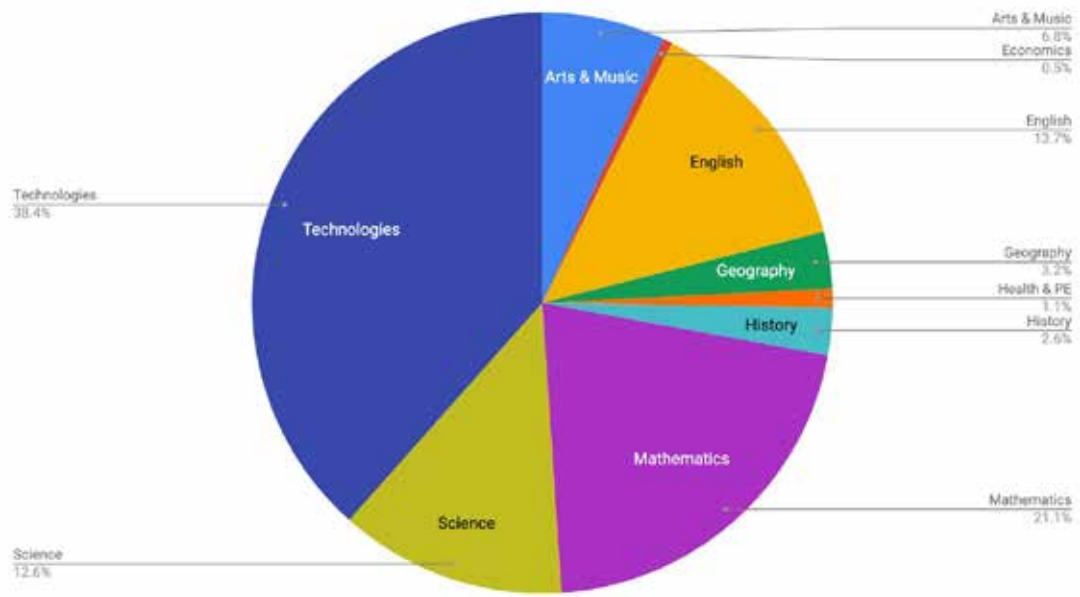
- 75 innovative learning programs that provide authentic, meaningful contexts for students to engage in STEM learning, using TfEL Learning Design.
- The units of work were created and uploaded in Makers Empire's Lesson Plan Builder.
- Units of work include a TfEL Learning Design template.
- The units of work will be made available on the Makers Empire website and Department for Education Moodle.
- The units of work demonstrate learning using 3D technology across curriculum learning areas using an integrated approach (see figure #).
- The units of work are representative of Reception to Year 7 classes (see figure #).



Showcase Attendance - Semester 1



Lesson Plans by Subject Semesters 1 and 2



DATA ANALYSIS

TEACHER DATA

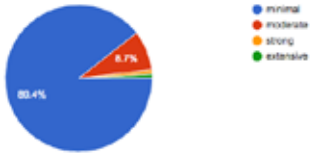
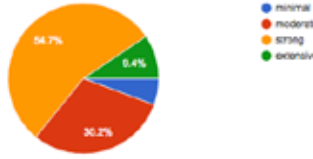
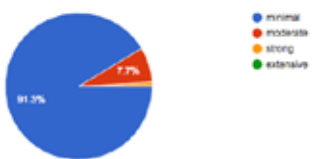
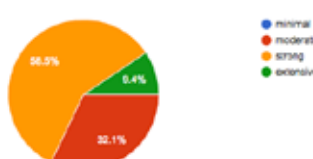
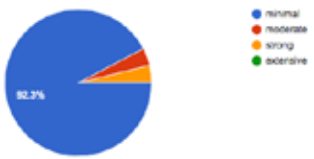


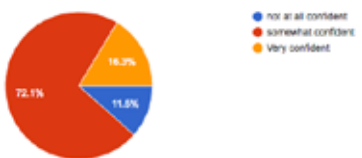

Of particular interest when comparing data collected in the pre and post-project surveys completed by teachers, was:

- 100% of teachers in the post-project survey said that they felt somewhat or very confident in their ability to teach STEM subjects, compared to the pre-project survey where 11.5% teachers said they were not at all confident.
- Increasing familiarity with the Australian Curriculum: Technologies learning area with 100% of teachers reporting a moderate to extensive understanding at the end of the project compared to the pre-project survey where 13.5% reported minimal knowledge.
- An increase in teachers' understanding of Design Thinking with 77.4% of teachers surveyed reporting a strong to extensive understanding in the post-project survey compared with 21.2% in the pre-project survey.
- An increase in teachers who reported using the TfEL Learning Design model to design learning for their students.
- A significant increase in teachers' technical knowledge of how to operate 3D printers and use Makers Empire 3D design software.

Pre and Post survey data

from teachers in the 3D printing and Primary Schools Project

Compiled by Karen Butler 16 October 2018

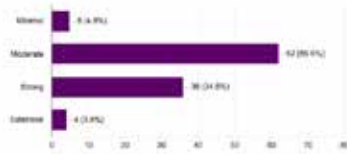
Technological Knowledge Pre	Technological Knowledge Post
<p>My technical knowledge of how to operate and use 3D Printing is 104 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive 	<p>My technical knowledge of how to operate and use 3D Printing is 53 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive
<p>My technical knowledge of how to use Maker's Empire 3D Modelling software is 104 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive 	<p>My technical knowledge of how to use Maker's Empire 3D Modelling software is 53 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive
<p>My technical knowledge of how to use other 3D Modelling software is 104 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive 	<p>My technical knowledge of how to use other 3D Modelling software is 53 responses</p>  <ul style="list-style-type: none"> minimal moderate strong extensive
<p>The likelihood of including new and emerging technology tools into my teaching and learning plans is 104 responses</p>  <ul style="list-style-type: none"> unlikely somewhat likely very likely Extremely likely - I have always been an early adopter of technology 	<p>The likelihood of including new and emerging technology tools into my teaching and learning plans is 53 responses</p>  <ul style="list-style-type: none"> unlikely somewhat likely very likely Extremely likely - I have always been an early adopter of technology
<p>My confidence in my ability to teach STEM subjects could be described as 104 responses</p>  <ul style="list-style-type: none"> not at all confident somewhat confident Very confident 	<p>My confidence in my ability to teach STEM subjects could be described as 53 responses</p>  <ul style="list-style-type: none"> not at all confident somewhat confident Very confident

Pedagogical Knowledge Pre

Pedagogical Knowledge Post

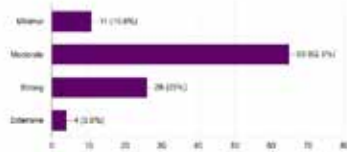
My understanding of the Teaching for Effective Learning Framework is

124 responses



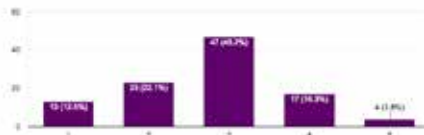
My understanding of the Teaching for Effective Learning Framework's Learning Design Model is

124 responses



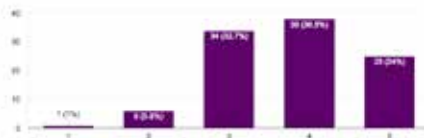
I refer to the TLEL guide and Learning Design Model when I plan my teaching and learning

124 responses



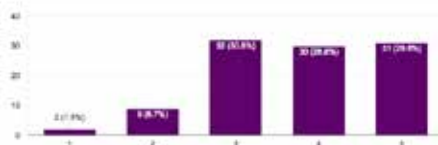
When introducing new technologies, I usually prefer to allow student to explore the digital tools before I explain how to use them

124 responses



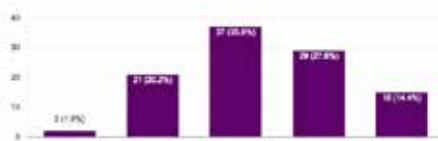
I use digital technologies across the curriculum

124 responses



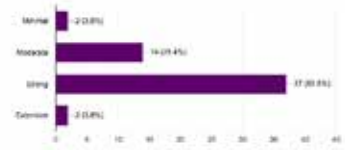
I create opportunities for students to solve authentic problems with and through digital technologies

124 responses



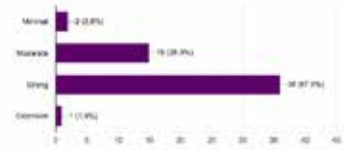
My understanding of the Teaching for Effective Learning Framework is

12 responses



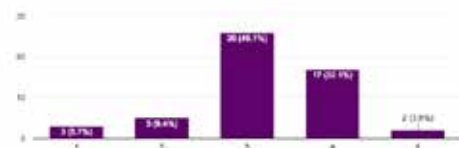
My understanding of the Teaching for Effective Learning Framework's Learning Design Model is

12 responses



I refer to the TLEL guide and Learning Design Model when I plan my teaching and learning

12 responses



When introducing new technologies, I usually prefer to allow student to explore the digital tools before I explain how to use them

12 responses



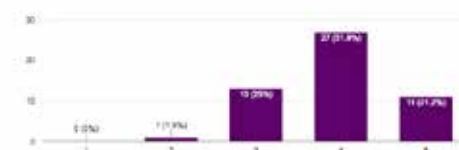
I use digital technologies across the curriculum

12 responses



I create opportunities for students to solve authentic problems with and through digital technologies

12 responses

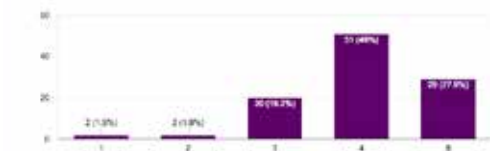


Pedagogical Knowledge Pre

Pedagogical Knowledge Post

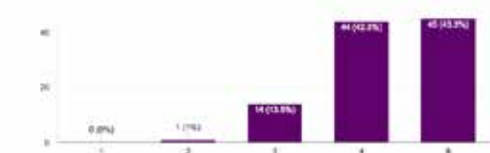
I encourage students to solve problems themselves, or with other students, when they "get stuck" using digital technologies

104 responses



I expect students to collaborate when using new digital technologies

104 responses



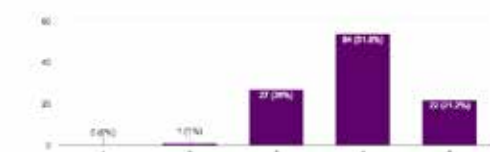
I encourage students to develop a growth mindset and perceive failure as enabling

103 responses



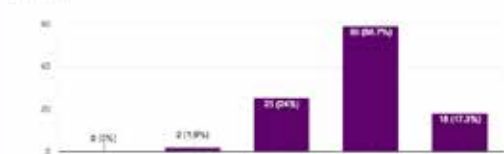
I use many formative assessment practices to check in with students

103 responses



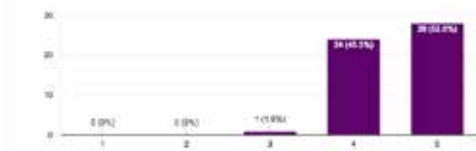
I create tasks that have many entry points and exit points

104 responses



I encourage students to solve problems themselves, or with other students, when they "get stuck" using digital technologies

83 responses



I expect students to collaborate when using new digital technologies

83 responses



I encourage students to develop a growth mindset and perceive failure as enabling

83 responses



I use many formative assessment practices to check in with students

83 responses



I create tasks that have many entry points and exit points

83 responses

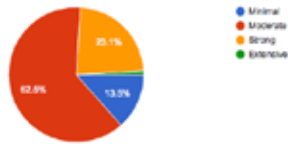


Content Knowledge Pre

Content Knowledge Post

My familiarity with the Technologies Learning Area in the Australian Curriculum is

104 responses



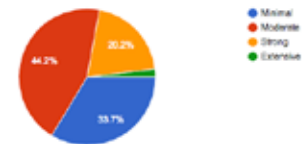
My familiarity with the Design and Technologies subject in the Australian Curriculum Learning area of Technologies is

104 responses



My understanding of "Design Thinking" is

104 responses



My familiarity with the Critical and Creative Thinking Continuum as part of the General Capabilities is

104 responses



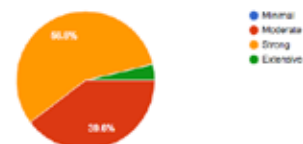
My familiarity with the Information and Communication Technologies General Capability is

104 responses



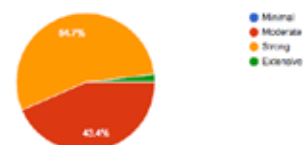
My familiarity with the Technologies Learning Area in the Australian Curriculum is

52 responses



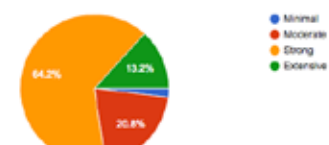
My familiarity with the Design and Technologies subject in the Australian Curriculum Learning area of Technologies is

52 responses



My understanding of "Design Thinking" is

52 responses



My familiarity with the Critical and Creative Thinking Continuum as part of the General Capabilities is

52 responses



My familiarity with the Information and Communication Technologies General Capability is

52 responses



STUDENT DISPOSITION DATA

Participating teachers were asked to randomly select 6 students (years 3-7) to complete disposition surveys pre and post project.

336 sets of survey data were collected.

Surveys were completed by 48 year 3 students, 61 year 4 students, 57 year 5 students, 73 year 6 students, 96 year 7 students and one student who didn't select their year level.

Survey data was collected from 167 female students, 164 male students and 5 students who didn't specify their gender.

When asked how strongly they agreed with the statement 'knowing how to use maths and science together will help me to invent useful things' students indicated an average of 3.96 agreement on a 5 point scale.

When asked how strongly they agreed with the statement 'when I leave school I will need to understand technologies for my future work' students indicated an average of 3.83 agreement on a 5 point scale.

When asked how strongly they agreed with the statement 'I believe using digital technologies is the way of the future' students indicated an average of 3.77 agreement on a 5 point scale.

When asked how strongly they agreed with the statement 'I am good with digital technologies' students indicated an average of 3.75 agreement on a 5 point scale.

2018 3D Printing in Primary School Dispositions in Learning

Thursday, March 07, 2019

336

Total Responses

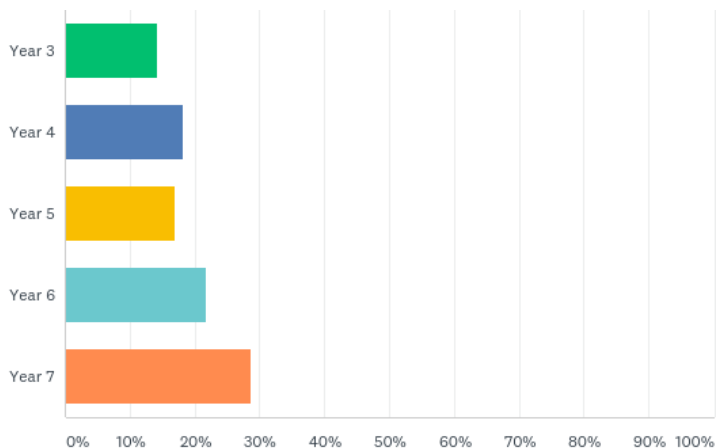
Date Created: Friday, July 13, 2018

Complete Responses: 336

Powered by  SurveyMonkey

Q2: Which year level are you?

Answered: 335 Skipped: 1



Powered by SurveyMonkey

Q2: Which year level are you?

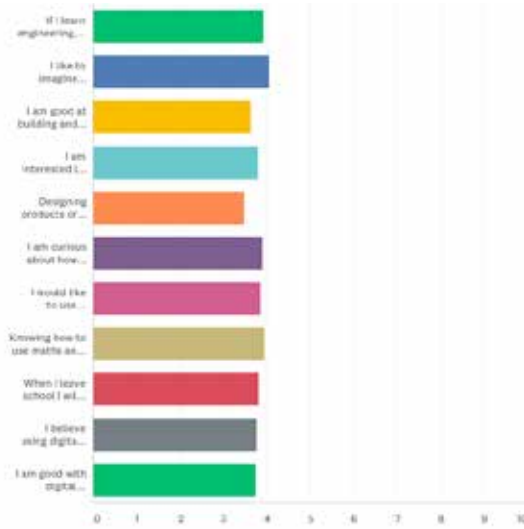
Answered: 335 Skipped: 1

ANSWER CHOICES	RESPONSES	
Year 3	14.33%	48
Year 4	18.21%	61
Year 5	17.01%	57
Year 6	21.79%	73
Year 7	28.66%	96
TOTAL		335

Powered by SurveyMonkey

Q4: Technology and Engineering Questions

Answered: 334 Skipped: 2



Powered by SurveyMonkey

Q4: Technology and Engineering Questions

Answered: 334 Skipped: 2

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
If I learn engineering, then I can improve things that people use everyday.	1.20% 4	5.11% 17	17.72% 59	51.35% 171	24.62% 82	333	3.93
I like to imagine creating new products	1.20% 4	6.61% 22	17.72% 59	35.14% 117	39.34% 131	333	4.05
I am good at building and fixing things	3.94% 13	10.61% 35	25.76% 85	37.58% 124	22.12% 73	330	3.63
I am interested in what makes machines work	3.38% 11	8.92% 29	21.23% 69	36.00% 117	30.46% 99	325	3.81

Powered by SurveyMonkey

Q4: Technology and Engineering Questions

Answered: 334 Skipped: 2

Designing products or structures will be important for my future work	3.95% 13	12.77% 42	32.22% 106	32.83% 108	18.24% 60	329	3.49
I am curious about how electronics works	2.74% 9	8.51% 28	16.41% 54	38.91% 128	33.43% 110	329	3.92
I would like to use creativity and innovation in my future work	1.80% 6	6.91% 23	25.23% 84	35.44% 118	30.63% 102	333	3.86

Powered by  SurveyMonkey

Q4: Technology and Engineering Questions

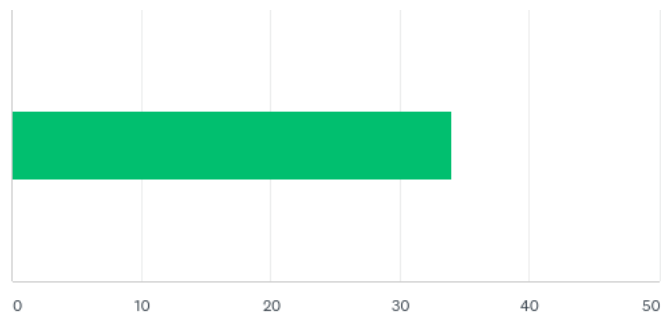
Answered: 334 Skipped: 2

Knowing how to use maths and science together will allow me to invent useful things	2.11% 7	5.14% 17	21.75% 72	36.86% 122	34.14% 113	331	3.96
When I leave school I will need to understand technologies for my future work	2.73% 9	8.48% 28	21.82% 72	37.27% 123	29.70% 98	330	3.83
I believe using digital technologies is the way of the future	1.22% 4	10.09% 33	28.13% 92	31.50% 103	29.05% 95	327	3.77
I am good with digital technologies	3.64% 12	7.88% 26	23.94% 79	39.09% 129	25.45% 84	330	3.75

Powered by  SurveyMonkey

Q5: How much do you already know about 3D printing?

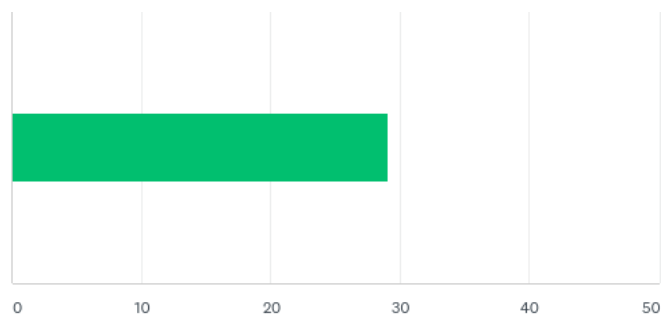
Answered: 330 Skipped: 6



Powered by  SurveyMonkey

Q6: How much do you know about using 3D modelling programs like Makers Empire or Tinker CAD

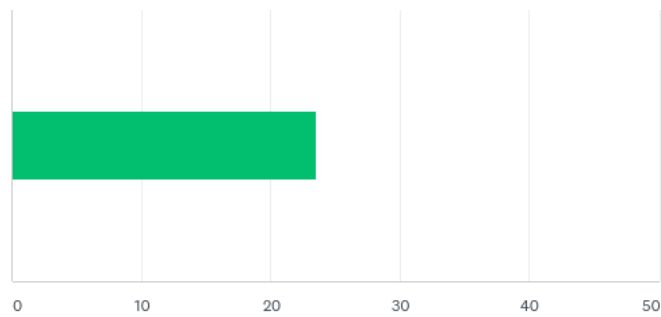
Answered: 319 Skipped: 17



Powered by  SurveyMonkey

Q7: How much do you know about the Design Thinking process?

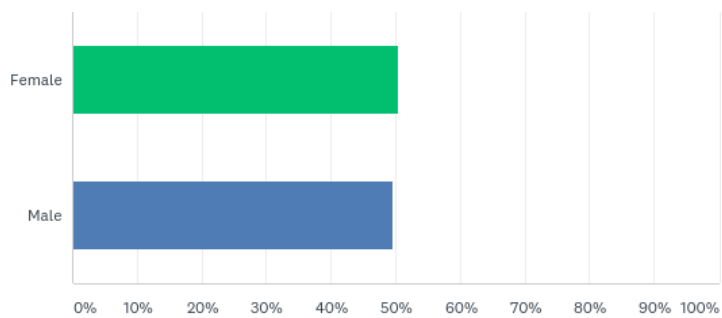
Answered: 322 Skipped: 14



Powered by SurveyMonkey

Q10: Please select which one is like you:

Answered: 331 Skipped: 5



Powered by SurveyMonkey

Q10: Please select which one is like you:

Answered: 331 Skipped: 5

ANSWER CHOICES	RESPONSES	
Female	50.45%	167
Male	49.55%	164
TOTAL		331

Powered by  SurveyMonkey

STUDENT SPATIAL VISUALISATION DATA

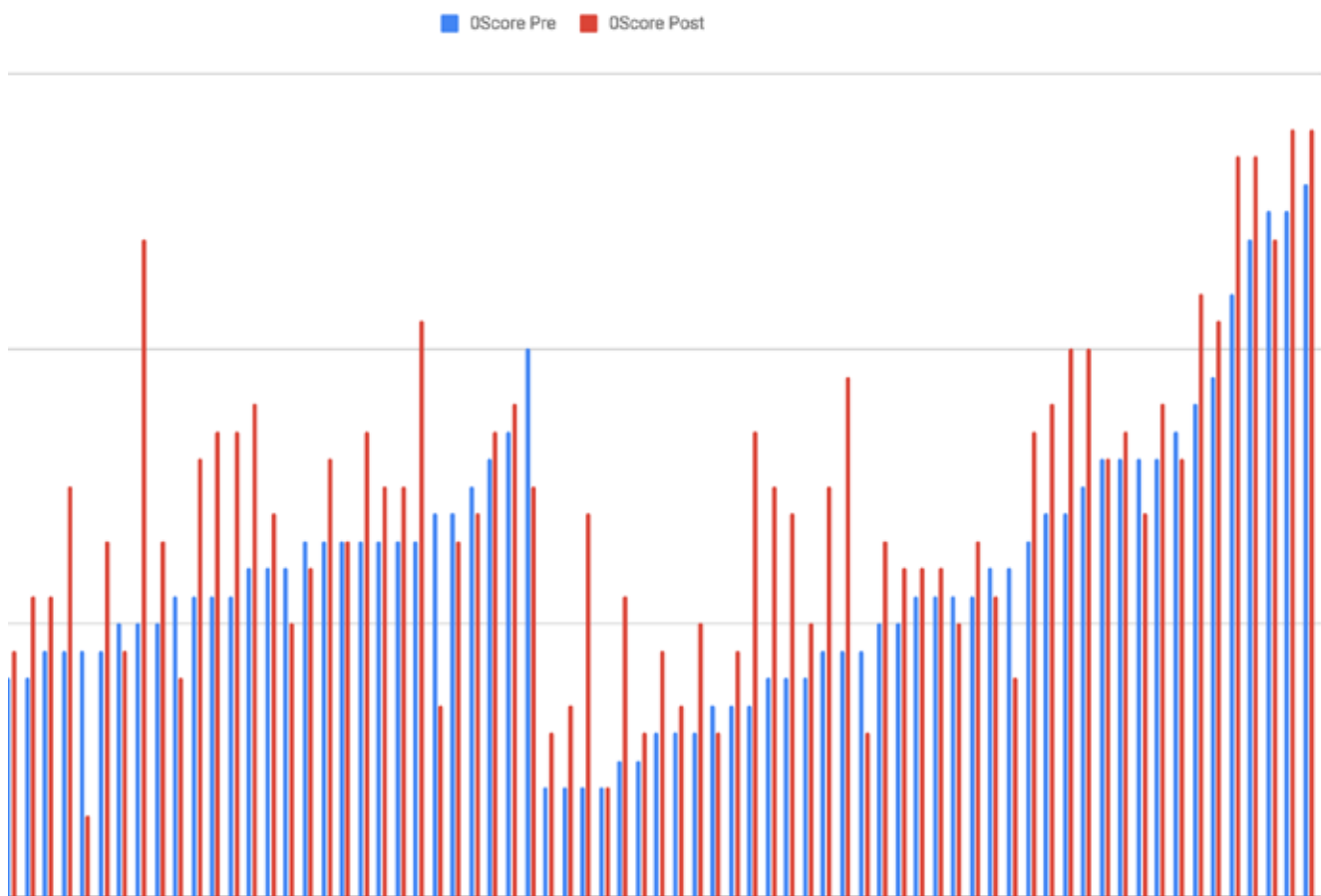
Students from 3 primary classes completed the Purdue Spatial Visualisation test before commencing the project and after the project completed.

77 students completed both tests.

The results show an overall increase in students' spatial visualisation and rotation abilities.

The scores of male students increased by an average of 12.25% and the scores of female students increased by an average of 13.7%

by gender.



Student name	Pre Score(Ra	Student Name	Post Score (R:
Student 1	17 / 30	Student 1	19 / 30
Student 2	14 / 30	Student 2	20 / 30
Student 3	22 / 30	Student 3	28 / 30
Student 4	16 / 30	Student 4	19 / 30
Student 5	14 / 30	Student 5	21 / 30
Student 6	17 / 30	Student 6	20 / 30
Student 7	24 / 30	Student 7	27 / 30
Student 8	23 / 30	Student 8	24 / 30
Student 9	28 / 30	Student 9	29 / 30
Student 10	16 / 30	Student 10	22 / 30
Student 11	13 / 30	Student 11	17 / 30
Student 12	23 / 30	Student 12	27 / 30
Student 13	14 / 30	Student 13	18 / 30
Student 14	14 / 30	Student 14	15 / 30
Student 15	15 / 30	Student 15	21 / 30
Student 16	14 / 30	Student 16	17 / 30
Student 17	17 / 30	Student 17	23 / 30
Student 18	13 / 30	Student 18	21 / 30
Student 19	16 / 30	Student 19	20 / 30
Student 20	13 / 30	Student 20	14 / 30
Student 21	17 / 30	Student 21	22 / 30
Student 22	14 / 30	Student 22	22 / 30

AMENDMENTS MADE DURING THE PROJECT

- Changes to original participants:
 - Challa Gardens Primary School withdrew from the project due to leadership and priority changes.
– Richmond Primary School took this position
 - Barmera Primary School withdrew from the project due to leadership and priority changes. Woomera Area School took this position and will participate in the project in Semester 2
 - Renmark Primary School withdrew from the project after the first professional learning day. They will rejoin the project in Semester 2
 - Cummins Area School withdrew from the Semester 2 cohort due to leadership changes in the school.
- Some schools, due to participate in the project in Semester 2 asked if they could start using Makers Empire software for familiarisation in Semester 1. Subscriptions were adjusted to allow Semester 2 schools early access.
- Changes made to the Makers Empire Teachers Dashboard in response to feedback from participating teachers, These include the ability for teachers to work collaboratively and simultaneously on a unit of work in the Lesson Builder, the ability to sort student data by gender for data collection purposes and a feature to archive classes from previous years.
- Improvements to the Makers Empire 3D modelling software in response to participant feedback and experience. This included input into the new Makers Empire Challenge Module and navigation features.
- The project team arranged to visit Kangaroo Island to facilitate the two professional learning days to ease travel and distance issues with this group of teachers being asked to attend the days held at Morphett Vale East Primary School.
- The date for the follow up professional learning day being shifted to April to avoid clashes with sports events in the local partnership.
- Additional risk assessment templates and safety advice provided regarding the use of 3D printers in schools developed, specifically the use of carbon and HEPA filters in 3D printers
- Professional Learning Day agendas were adjusted to allow travel during daylight hours for teachers in regional schools.
- The provision of informal Makers Empire Cafe events to provide additional support and networking opportunities for project participants.
- An additional showcase event was added to the program, held in Port Augusta on Monday November 26th to allow easier access for remote and rural schools. Woomera Area School, Kimba Area School, Wudinna Area School and Coober Pedy Area School attended this event. Streaky Bay Area School were unable to attend this event due to staff illness.

SUMMARY, FINDINGS AND BUSINESS INTELLIGENCE

PARTICIPATION

Participation records show high levels of participation in all project activities with 100% of schools participating in the face-to-face professional learning days for both Semester 1 and Semester 2.

192 teachers participated in the face-to-face professional learning days. In addition, the days were also attended by site leaders and IT support staff also attending.

One school, Cummins Area School, was accepted as a participant but withdrew after the commencement of the Semester 2 cohort. As such the project involved 99 school participants.

96 out of the 99 schools participated in showcase events. Three schools did not attend a showcase event due to staff illness and calendar clashes.

PROGRAM LENGTH

The program was planned over two terms for each cohort. This allowed teachers to spend a term planning, engaging in professional learning, and developing technical skills, and then dedicate a second term to teaching their units of work with their students. In hindsight, late Term 4 was not an ideal time to ask teachers and students to present their work with competing demands at the end of the school year.

UNITS OF WORK

75 units of work were published as a result of this project, representing a 74% completion rate. Some teachers have partially documented the units of work they completed or are still in the process of documenting their work. This indicates a 97% completion rate of units of work being developed and taught.

DELIVERY

All professional learning activities in the project were co-designed and delivered by DECD and Makers Empire project members. As a recommendation from the 2017 project, this provided a seamless and collaborative approach for participants.

TECHNICAL AND SAFETY CONSIDERATIONS

Safe operating procedures and sample risk assessments for using 3D printers in primary schools were developed collaboratively by the Department for Education and the Makers Empire team. All site leaders were invited to sessions within the professional learning program and provided with safety information.

BUILDING SCHOOL WIDE CAPACITY AND IMPLEMENTATION PLANS

Building school-wide capacity and developing a site implementation plan for the integration of 3D technology were identified as desired outcomes of the 3D Printing in Primary Schools project. There were notable success stories to illustrate these outcomes, including:

- Participating teachers from Port Elliot Primary School ran after school workshops for other teachers in their school and also invited teachers from other local schools.
- Richmond Primary School planned a pupil-free day for participating teachers to share their learning and to aid school-wide implementation.
- The site leader at Coober Pedy Area School planned a strategy to facilitate continued interest amongst staff and provisions for staff change over.

SUMMARY OF MAKERS EMPIRE INVESTMENT

As part of the project Makers Empire has provided the following resources and support:

- 100 x Makers Empire Learning by Design blended professional learning course, including school wide 12-month subscriptions to Makers Empire (valued at \$5000 per school)
- Planning and facilitation of face-to-face professional learning days including provision of all learning resources and materials such as printed exemplars and templates.
- Makers Empire Learning Team personnel, equivalent to FTE 1.0 over Term 1 and 2, 2018.
- Establishment and maintenance of Facebook professional learning community.
- Establishment of Department for Education Moodle and sharing of intellectual property and resources on this learning platform.
- 20+ site visits and online support sessions for 3D printer hardware and software support, professional learning support
- Preparation for showcase event
- Individualised support as needed, including technical support and email/phone enquiries.
- Collation and publication of 75 units of work.

Cost to the Department for Education :

Makers Empire Learning by Design Course, including 12-month subscription to Makers Empire 3D Learning program- \$5000 per school.

Cost to Participating Schools:

TRT costs to support teacher attendance at the face-to-face training per school:

Approximately 6 days of TRT release at \$530 = \$3180 (assuming two participants being released for 2 face-to-face professional learning days and the showcase event)

Purchase of 3D printer package, if desired, for \$1499 including 3D printer, filament, hardware training and support.

RECOMMENDATIONS

Further iterations of the project need to focus on assessment and measuring specific student learning outcomes.

Lower attendance at the online components of the professional learning activities suggest that this needs to be made more relevant and accessible to participants in future iterations of the project.

Additional support is required to enable full participation of regional and remote schools. It is recommended that future iterations of the project include resources to enable regional and remote schools to travel to a central showcase event to enable students and teachers to benefit from experiencing a wider range of learning examples.

Logistical considerations for the project would be easier to manage if participating schools were grouped in more geographically local clusters. This would also enable better networking opportunities and support for further implementation after the project.







To better support school wide implementation plans and capacity building, future iterations of the project should be based on a 3-year plan including 3-year Makers Empire subscription, ongoing support and input from previous project participants.







A grayscale photograph of a teacher with glasses leaning over a table to assist three young children. One child is holding a tablet, and another is pointing at one on the table. The table is cluttered with various toys and objects. The background shows a bright window.







APPENDICES







1. Overview of units of work
2. Sample unit of work
3. Media coverage







Appendix 1 - Overview of Units of Work: Semester 1







1	Insects of the Future		
	School:	NOA009	<p>Insects within our local area are becoming extinct. Students need to design a super insect to increase our biodiversity. Through exploration, students will then identify and create a new habitat for their insect.</p>
	Year Level/s:	K - 1	
	Context:	Technology, Science, Mathematics and English	
			
2	Totem Toppers		
	School:	MTB001	<p>Students will design a pencil topper that makes their pencil easily identifiable and unique. Their design will represent themselves using their knowledge of symbols, totems or emblems.</p>
	Year Level/s:	3	
	Context:	Technologies, Mathematics and History	
			
3	Wetlands Plan		
	School:	FP013	<p>The school has been looking to develop our wetland area for some time. Now, with a sustainability focus across the school, children have identified it as an area to develop. Many ideas have been brainstormed. The children will now follow the design process to choose a solution, justify that choice and put a real world improvement/solution into action.</p>
	Year Level/s:	5, 6 and 7	
	Context:	Technologies, Science, Mathematics, Geography and English	
			
4	Fidget Toys		
	School:	NOA011	<p>You have been invited to join a group of developers to design the next big craze in fidget toys. Design and build a new fidget toy that will take over just like Fidget Spinners and Fidget Cubes. Create a presentation to market your toy.</p>
	Year Level/s:	5, 4	
	Context:	Technology and Mathematics	
			
5	3D Printing Overview		
	School:	FP009	<p>students from different year level classes collaborate to create their own game board characters.</p>
	Year Level/s:	2, 5 and 6	
	Context:	Technologies, Science, Mathematics and English	
			
6	Login Tags		
	School:	NOA001	<p>The Problem: "Students constantly forgetting login details". Students will use Maker's Empire software to create a 3D printed solution.</p>
	Year Level/s:	6	
	Context:	Technologies	
			





7	Fidget Tools		
	School:	MTB002	Students learn about some of the purposes of fidget tools and the key elements they often have in common. Students then design their own new version of a fidget tool.
	Year Level/s:	1	
	Context:	English and Technologies	
			
8	Class Mascot		
	School:	NOA006	Class will collaboratively design and 3D print a class mascot to help identify all the traits/personality our class possess.
	Year Level/s:	1	
	Context:	English and Technologies	
			
9	Bag Tags		
	School:	NOA006	In collaborative teams students work together through design process to produce a product. Define and document real life problem that would require bag identification.
	Year Level/s:	5 and 6	
	Context:	Technologies and English	
			
10	Improving Tech		
	School:	FP010	Students are given the opportunity to identify a problem that they are to solve with a simple 3D object. Potential examples include creating viewfinders for the webcams on student Chromebooks so that they can be used as a point and shoot camera or video camera; or creating a rigid stand for iPads so that they can be used to create stop-motion animations.
	Year Level/s:	5, 6 and 7	
	Context:	Technologies and Mathematics	
			
11	Save Our Netbooks		
	School:	NOA002	We finally have our netbooks (laptop) for 2018... but as a class, we have concerns that having our water bottles on the desk that may leak or tip over and spill could damage the new devices. Is there are way we can have both water bottles and netbooks near us at the same time safely?
	Year Level/s:	6 and 7	
	Context:	Technologies, Science and Mathematics	
			
12	School Improvement Plan		
	School:	NOA010	Students will have the opportunity to explore areas of the school that could be improved and pose possible solutions through the design thinking process and come up with prototype solutions in groups for possible solutions to problems within their school environment.
	Year Level/s:	3 and 4	
	Context:	Technologies	
			

13	Who Am I?		
	School:	MTB003	Students will go through the design process and print a prototype mascot that represents an aspect of their identity, which can then be used or referred to in various activities. For example Jack designed and printed a tractor to represent his passion in farming.
	Year Level/s:	3 and 4	
	Context:	Health & PE, Technologies and Mathematics	
			
14	Colourful Cooking Utensils for the Mud Kitchen		
	School:	MB001	Students use the design thinking process to design and create colourful cooking utensils for the Mud Kitchen at our school.
	Year Level/s:	6 and 7	
	Context:	Technologies	
			
15	Name Cube		
	School:	MB001	Each student will design a name cube to keep on their table.
	Year Level/s:	K - 1	
	Context:	Technologies and Mathematics	
			
16	Birds and Beaks and What They Eat		
	School:	NOA017	Look at local birds and their beak adaptations. Use internet and books for research. Students take photos and observation notes about bird beak shapes and diets and determine whether there are similarities between beak type and diet amongst different types of birds in their local area. Students design a replica of different beak types in 3D using Makers Empire.
	Year Level/s:	5 and 6	
	Context:	Technologies, Science, Mathematics and English	
			
17	Bee Bot Trailers		
	School:	MTG001	where are the trailers for the Bee Bots? Students will work in groups to research ideas and design a trailer that will be able to be pulled by a bee bot. Once the design process has been completed groups will be asked to make a prototype of their bee bot trailer to the best scale as possible. Once complete they will review their original design and make any adjustments needed.
	Year Level/s:	5 and 6	
	Context:	Technologies	
			
18	Pencil Holders		
	School:	GR001	We are always losing or looking for a lead pencil. How might we make it easier for us to identify our property and increase the chances of our pencil being found and returned to us? Students brain storm criteria, prototype their ideas, seek feedback and then design their individual pencil holder/topper using Makers Empire.
	Year Level/s:	2, 3 and 4	
	Context:	Technologies, Science, Mathematics, English, Art & Music	
			







19	Doll House Furniture		
	School:	GR001	<p>The classroom doll house furniture needs to be replaced. Students discuss the rooms within the doll house. What could a doll do in each room? Why would they go into that room? Make a list of things done in each room of the house. Talk about what types of furniture is used in each room. Students will make a piece of furniture for everyone to play with in the refurbished doll house.</p>
	Year Level/s:	K-1	
	Context:	Technologies and Mathematics	
			
20	Lost Pencils		
	School:	MB002	<p>Students will design a pencil holder that can fit their pencil and is personalised so anyone in the class can easily identify who missing pencils belong too. Pencil holders should be designed to prevent the pencil from rolling off of the table easily.</p>
	Year Level/s:	1 and 2	
	Context:	Technologies and Art	
			
21	Device Dilemma		
	School:	MTB004	<p>Students are to look at the issue of space on our desks. What are some of the issues. For example laptops & books falling off and not enough room for everything. They will brainstorm some of these issue and come up with a design to help alleviate the issues. The design should be able to hold a surface pro, iPad, or book.</p>
	Year Level/s:	7	
	Context:	Technologies, Science and Mathematics	
			
22	Tiger Values		
	School:	MB004	<p>Students will design a useful memorabilia item which represents the school, its mascot and values, to sell in the School Shop.</p>
	Year Level/s:	6 and 7	
	Context:	Technologies	
			
23	USB Identifier		
	School:	MB005	<p>In this unit students will design and create a cover for their USB in shaper. Their USB must be easily identified as belonging to the owner. The cover must fit firmly but still be easily removed, and include an attachment that will allow it to be hung from a pin in the wall.</p>
	Year Level/s:	4, 5, 6 and 7	
	Context:	Technologies and Mathematics	
			
24	Movement Pass Project		
	School:	FP004	<p>This unit is designed to solve a school specific problem we have around movement passes. Movement passes are a tag attached to a lanyard that children wear when leaving the classroom. We had issues at our school with movement passes being lost therefore designed this unit to help solve this problem.</p>
	Year Level/s:	3, 4, 5, 6 and 7	
	Context:	Technologies	
			







25	Ngurunderi		
	School:	MB003	Students will learn about local Indigenous history of the Ngarrindjeri people through the Dreaming story of Ngurunderi. They will design and create a 3D object to assist them in the retelling of this story to younger students and to promote Aboriginal culture in our school.
	Year Level/s:	6	
	Context:	Technologies, History, English	
			
26	Garden Characters		
	School:	FP012	Character design to engage students in writing literacy texts. Learning about the design process prior to making.
	Year Level/s:	2	
	Context:	Technologies	
			
27	Magical Mythical Creatures		
	School:	NOA004	Students will be immersed in myths and stories of mythical creatures. They will use Maker's Empire software to design their own mythical creatures. They will seek peer feedback about their design features before printing their models. Students will discuss where their mythical creature would live, and what they would need to survive? What food would they eat? Students will then write a fantasy information text.
	Year Level/s:	3 and 4	
	Context:	English, Mathematics and Technologies	
			
28	Wheelchair Accessible Playground		
	School:	FEL001	Research accessible play equipment, propose improvements to our school playgrounds and design alternative equipment using Makers Empire.
	Year Level/s:	1, 2, 3 and 4	
	Context:	Technologies, Mathematics, Health & PE	
			
29	Dog Tags		
	School:	NOA015	Council dog tags often irritate the dog as only one size fits all. They can also break or fall off costing the owner more money. How might we design a unique and personalised alternative?
	Year Level/s:	1, 2, 5 and 6	
	Context:	Technologies and Science	
			
30	Hat Hooks		
	School:	NOA016	School hats are lost, misplaced and need to be kept safe so access is simple and easy. This unit plan positions students to take ownership of this problem by linking prior knowledge and visualising what hook might work draw design possible solutions before designing and testing prototypes. Throughout the lessons, creative and critical thinking routines have formed part of the learning process.
	Year Level/s:	1 and 2	
	Context:	Technologies, Science, Mathematics, History and English	
			







31	3D Animal Adaptions		
	School:	FP011	<p>In this unit students will research, design, create and print 3D animal models, which have structural features and adaptations, suited to particular Australian environments. Students will plan, write and critique an information report about their 3D animal.</p> 
	Year Level/s:	4, 5 and 6	
	Context:	Technologies, Science and English	
32	Dolls House Challenge		
	School:	FP011	<p>This unit was designed for students New Arrived in Australia who need to develop vocabulary of homes and furniture.</p> <p>During this unit children will explore the homes, how homes are different and learn the names of rooms and furniture. Students will explore the concepts of needs and wants, they will learn about 3D shapes identifying and naming them and seeing them in the world around them.</p> 
	Year Level/s:	K, 1 and 2	
	Context:	Technologies, Science, Mathematics and English	
33	3D Printing Club		
	School:	NOA008	<p>Students to be introduced to project as 'Program Testers'. Discussion about how 3D printing can be used to support students at SASVI. Pose inquiry question "How can I use 3D printing to improve access for people with vision impairment?" Guiding questions: "What challenges do I/we face at school and/or in the community?"</p> 
	Year Level/s:	3, 4, 5, 6 and 7	
	Context:	Expanded Core Curriculum & Technologies	
34	Hooking Them In		
	School:	FP015	<p>At Wandana, the Upper Primary classes have not got anywhere to hang their school hats...so we are going to solve this problem by designing and creating hat hooks in the classrooms.</p> 
	Year Level/s:	5, 6 and 7	
	Context:	Technologies, Mathematics and Art	
35	Drink Bottle Dilemma		
	School:	FP008	<p>Students will design a solution that will assist with common drink bottle dilemma's faced by students in school such as condensation, leakage, being knocked over and cracking.</p> 
	Year Level/s:	4, 5, 6 and 7	
	Context:	Technologies and Science	
36	Bin Latch		
	School:	FP001	<p>Students are empowered to investigate their own ideas and responses to a site based issue. Big Idea: What is a challenge that we can explore as a class where we can use the Makers Empire pedagogy as a solution?</p> 
	Year Level/s:	4, 5, 6 and 7	
	Context:	Technologies, Science & Mathematics	







37	Redesign Our Fresh Badges		
	School:	MTB005	<p>Would it be more financially viable for us to buy a 3D printer and print our own FRESH badges?</p> <p>Currently the school is spending \$1600/year on FRESH values badges ... would it be financially savvy to design our own badges and using a 3D printer and buy a printer and print our own individual badges?</p>
	Year Level/s:	6 and 7	
	Context:	Technologies, Mathematics, English and Economics	
			
38	Solutions For Elderly People		
	School:	FP005	<p>Students will design a personalised 3D printed solution to a problem for an elderly person.</p>
	Year Level/s:	6 and 7	
	Context:	Technologies, Science and English	
			
39	Animalia Inquiry		
	School:	FP005	<p>Students explore animal habitats focussing on specific features including shelter, food, clean air, water, space and play. Students will design and construct a prototype to improve an animal habitat at the Zoo incorporating Maker's Empire.</p>
	Year Level/s:	2	
	Context:	Technologies, Science, Mathematics, English and Art	
			
40	Iggy Peck Bridge Building		
	School:	NOA014	<p>The students will listen to Iggy Peck Arcitect by Andrea Beaty then they will gather information about bridges and build a bridge of their own.</p>
	Year Level/s:	1 and 2	
	Context:	Technologies, Mathematics, Geography and English	
			







Appendix 1 – Overview of Units of Work: Semester 2






1	<p>Bountiful Badges</p> <p>School: GA001 Year Level/s: 5, 4, 2003 Context: Mathematics,Technologies</p>	<p>Being a student leader at school means you get the opportunity to wear a special badge with pride. Unfortunately these coveted badges have a habit of disappearing. This means that the next leader in line misses out and it becomes expensive and time consuming to order new badges. To keep costs down we have decided to design and print our own leadership badges. These can be custom made to suit each specific leadership position.</p>	
2	<p>Tomatoes All Year</p> <p>School: GA001 Year Level/s: 5, 4 and 3 Context: Technologies,Science,Mathematics</p>	<p>We have had a fine time researching food "From Paddock To Plate." One of our favourite cooking lessons is making pasta with a tomato-based sauce. However, we have a problem. We have learnt that the best tastes comes from fresh produce, but tomatoes are a seasonal food. Our challenge is to design a way that we can grow tomatoes , here at school, all year round.</p>	
3	<p>Robot Obstacles</p> <p>School: GA006 Year Level/s: 43652 Context: Technologies</p>	<p>To have a robot move through a set course. The aim of this lesson is to create obstacles for the robot to maneuver on, over, under or around. For example to make a ramp for the robot to go up and over. To make a tunnel for the robot to go through. Maybe to create multiple so you could set up a race course.</p>	
4	<p>Let's AmalgAMATE</p> <p>School: GA003 Year Level/s: 7, 6, 5, 4, 3, 2, 1, K Context: Technologies, Mathematics</p>	<p>This lesson plan shows a process for creating a new logo designed by the WHOLE school community through discussion, planning, data collation and the use of Blocker or Shaper to bring the students ideas to life in real time! This lesson could be adapted for many purposes ie: a new sports logo, sports t-shirt or senior year level "graduation" merchandise. It also identified a need for persuasive writing, oral language skills and descriptive writing when reflecting.</p>	
5	<p>3D Printing in Primary Schools 2018- Introduction to Design Thinking</p> <p>School: PA001 Year Level/s: 5, 4 , 3 Context: Technologies</p>	<p>This is an Introduction to 3D printing</p>	
6	<p>Texta Organiser</p> <p>School: FEL002 Year Level/s: 7 and 3 Context: Technologies, Science, Mathematics, Art and Music</p>	<p>Students generate a variety of ideas for a texta holder</p>	

7	Design a Playground		
School: FEL005 Year Level/s: 6 and 4 Context: Technologies	Introduce Real Life Problem		
8	Build a Game Board Based on a Book		
School: PH003 Year Level/s: 4 and 3 Context: Technologies, Mathematics, English, Art & Music	This unit of work was designed because the Middle Primary class are fixated on online gaming and technology. Many parents and teachers have been concerned with the amount of screen time the children want to have.		
9	What is this? A school for ants!		
School: PA002 Year Level/s: 10, 9 and 7 Context: Technologies, Science, Mathematics	Create a 3D representation of the school grounds for visitors, new students, etc. Must include appropriate scale to fit in a persons hand and labelled buildings.		
10	Hat Hooks		
School: PH005 Year Level/s: 7, 6, 5, 4, 3, 2, 1 and K Context: Technologies, Mathematics, English	Students will go through the Design Thinking process in order to solve the constant issue of misplaced/missing hats during term 1 and 4. The aim will be that the students (with guidance) will identify the issue of their hats not always being where they 'think' they left them.		
11	Pencil Pot		
School: PTL002 Year Level/s: 5 and 4 Context: Technologies, Mathematics	Students are given the opportunity to identify a problem that they are to solve with a simple 3D object. Potential examples include creating viewfinders for the webcams on student Chromebooks so that they can be used as a point and shoot camera or video camera; or creating a rigid stand for iPads so that they can be used to create stop-motion animations.		
12	Project submission - Fidget Tool		
School: MTB014 Year Level/s: 3, 2, 1 and K Context: Music, Technologies	The challenge is to design something which will eventually be printed in 3D, that could fit in your pocket/hand, to help you listen/focus better.		

13	Learning From Our Mistakes - Remembering the Extinct Animals		
School: FEL007 Year Level/s: 5 and 4 Context: Technologies, Science, Mathematics, History, Geography, English, Art & Music	The students from our class will create a museum for extinct or critically endangered animals. They will use Makers Empire to design a model replica of their animal that will act as their display. They will research the history of the animal and the actions/events/implications that led to their demise, and how it can be avoided in the future.		
14	What is a real world problem to us?		
School: PH006 Year Level/s: 7 and 6 Context: Technologies	This is a Design Thinking project where students investigate a real world problem to them. They become 'problem finders' as they investigate what is a problem they can solve as design consultants using 3D design software and 3D printing.		
15	Class Problem Solving		
School: PH006 Year Level/s: 3 Context: Technologies, Science, Mathematics, English	Our class identified an issue with our room door handle. It was too wet and slippery when we came back from breaks and children were being locked outside. We realised that other people have this issue too, like the elderly with Arthritis or amputees, so we came up with a few possible solutions. These predominantly included a friction ring that magnified the torque applied by the hand and some finger holds to give better grip.		
16	Frog Enclosure		
School: KA002 Year Level/s: 3 and 2 Context: Technologies	Each student collected tadpoles as class pets, we watched them develop into frogs and 'realised' we needed to set up their enclosure. We researched frog enclosures and what their habitat looked like in the wild and brainstormed the items they might need to be comfortable. From that brainstorm we grouped their ideas and came up with 4 main features we could design and make.		
17	Puppet Making		
School: KA002 Year Level/s: 3 and 2 Context: Technologies, English, Art & Music	Challenge is to create a puppet with a moving part. Students will then present their puppet show. Each member of the class will take turns filming their peers puppet shows. Students will go back and watch their own video and assess themselves.		
18	Make A Change, Be A Change Maker!		
School: FEL011 Year Level/s: 5 and 6 Context: Technologies	In this unit, students develop empathy for others through solving real-world problems within the school community using 3D printing technology. It provides students with opportunities to see how they can make a difference and make something better for someone else.		

19	<h3>Helping farmers in a drought</h3> <p>School: GA009 Year Level/s: 7, 6, 5, 4 and 3 Context: Technologies, Science and Mathematics</p>	<p>Currently parts of our state are experiencing the worst drought they have seen in almost 100 years. Apart from the obvious shortage of animal food, paddocks are barren and subject to several daily dust storms. After setting up a Rope 4 Hope campaign and sending a truckload of hay to farmers on the Eyre Peninsula in South Australia, we discovered that there were many other issues that were affecting farmers. One of these issues was that farmers were spending a lot of time emptying sheep troughs due to them filling with mud from the dust. This was a daily occurrence and was a huge issue for farmers.</p>	
20	<h3>Designing a Christmas Decoration</h3> <p>School: FEL003 Year Level/s: 7 and 6 Context: Art & Music</p>	<p>Research about Christmas decorations and see how they are made. Use Maker's Empire to design their own Christmas decoration</p>	
21	<h3>Christmas Decoration</h3> <p>School: FEL003 Year Level/s: 4 Context: Technologies</p>	<p>Children will design a christmas decoration as a present for parents at the end of the year.</p>	
22	<h3>How can we make our wheels stay in place?</h3> <p>School: GA010 Year Level/s: 7, 6 and 5 Context: Technologies</p>	<p>Learning how to use the Makers Empire software by designing a component that will solve the problem of model wheels falling off their design challenge models.</p>	
23	<h3>Accessible Support</h3> <p>School: GA010 Year Level/s: 5, 6 and 7 Context: Technologies</p>	<p>Students will speak with a member of the community around designing a solution to a problem they are experiencing in their everyday life. They will interview a young adult who has muscular dystrophy and speak with them regarding their arm support when playing wheelchair sports. This member of the community will outline their limitations and needs. Students will record these responses and complete the necessary measurements form a success criteria. Students will then go through the planning process to come up with a solution to this problem.</p>	
24	<h3>Adventure Playground</h3> <p>School: GA008 Year Level/s: 4, 3 and 2 Context: Technologies and Mathematics</p>	<p>Students to further develop their Adventure Playground</p>	

25	Pump improvement		
School: MTB010 Year Level/s: 7, 6 and 5 Context: Technologies, Art & Music	A task to improve our hand pump and make it fun to use.		
26	Design Tech Term 3		
School: KA004 Year Level/s: 7, 6, 5, 4 and 3 Context: Technologies	Design tech in term three is around designing and building the sets for the school concert. Students will discuss the play and brainstorm possible back drops for the stage. How will what they design set the scene and help tell the story for the audience? Will the set enhance the story? Make decisions about suitable materials to built the sets for appropriate size, movability and sturdiness.		
27	First Lesson		
School: FEL012 Year Level/s: 4 Context: Technologies	Student's were asked to analyze, design and create a time capsule that could hold example of memorabilia from 220 students, staff and community.		
28	Sustainable Bee Sanctuary		
School: FEL004 Year Level/s: 6 and 5 Context: Technologies and Science	Students work in collaborative teams to create design solutions for a sustainable school bee sanctuary. They identify an initial problem and use a design thinking process to create a sustainable, ethical and creative solution. Year 7 students can also consider enterprising solutions that can positively impact the development of a school bee sanctuary.		
29	Lighthouse Keeper's Lunch		
School: FEL009 Year Level/s: 7, 6, 2 and 1 Context: Technologies, Science, Mathematics and English	Buddy classes meet and read The Lighthouse Keeper's Lunch by Ronda Armitage. Students work in pairs to analyse the text according to the 60s. Students create a new complication and design a 3D printed solution. Students create an electronic book of their new story.		
30	It's A Jungle Out There		
School: GA005 Year Level/s: 3, 2 and 1 Context: Geography, English, Technologies, Science, Art & Music	Based on the musical It's A Jungle Out There, students will be focusing on a specific jungle animal where they will research and present their finding using a diorama.		

31	Sports' Shed Problem		
School: GA005 Year Level/s: 6, 5 and 4 Context: Technologies and Mathematics	Students will design and 3D print a name magnet to help them borrow sports equipment from the sports shed.		
32	Souvenir		
School: PA004 Year Level/s: Context: Geography and English	Students design their own holiday brochure. Students create their own souvenir for their holiday destination.		
33	Pencil toppers		
School: PTL003 Year Level/s: 2 and 3 Context: Technologies, Mathematics	To individualise students shared stationery (lead pencils), students will design a unique pencil topper. They will research ideas, design their own and label the measurements. They will explore the functions on Makers Empire to create their designs; re-sizing, merging, duplicating, negative space and using the ruler, before printing, testing, refining and colouring their pencil toppers for use.		
34	Stationery Holder		
School: PTL003 Year Level/s: 6 and 5 Context: Technologies, Mathematics	Students waste time finding the appropriate stationery to use. They rummage through pencil cases and their bags. They have expressed a need for a Stationery Holder for their desk so that they can access their stationery efficiently. Students will design and 3D print a Stationery Holder for their desks. The Stationery holder must hold specific stationery, have several compartments and be no larger than 120mm wide, 120mm long and 80 mm high.		
35	Australia's" Big Things"		
School: PTL003 Year Level/s: 3 and 2 Context: Technologies, Mathematics, History, Geography, English, Art & Music	As we explore Australia, we see many 'Big Things' that are landmarks for tourists. In this unit, students use an understanding of Aboriginal and Torres Strait Islander histories and culture to design a 'Big Thing' for a location based on a dreamtime story.		



Hooking them in at Wandana

Grade Level/s:
5, 7, 6

Subject/s:
Technologies, Mathematics, Art & Music

Type:
Unit Plan

Author:
Giuseppina Aloï and Nigel Randall

At Wandana, the Upper Primary classes have not got anywhere to hang their school hats...so we are going to solve this problem by designing and creating hat hooks in the classrooms.

Single Lesson Plan

Exploring Makers Empire

Task:
Step 1 - Download Makers Empire App onto laptops 20 min

Activity:
Students go through procedure of logging on and restarting laptops to install Makers Empire onto their logons.

Resources:
Laptops, Makers Empire App

Step 2 - Participate in Makers Empire Tutorials 30 min

Students will work independently using Makers Empire software. They will work through the Shapes Challenge to become familiar with the features of the software. They will also participate in tutorials in the software. Students watch the Emoji video/Emotions dice video then practise making their own emojis.

Laptops, Makers Empire App Emotions Dice video on Makers Empire website

Where can the hats go?

Task:
Step 1 - Exploring the real world problem 30 min

Activity:
Students will be introduced to the real world Where can we put our hats? Students in groups discuss ideas of how we can solve the problem. Discuss the ideas with another group. Discuss idea of creating a hook to hang hats on with the whole class.

Resources:

Aligning *what* and *how* of teaching and learning in the Australian Curriculum

What is the intended learning and why is it important?

Students learn how to use Makers Empire app to design a printable, functioning product that solves a problem they have identified and investigated.

Students develop understanding of 'design thinking' and 21st Century Learning principles – collaboration, communication, problem solving, innovation, etc.

What do we want them to learn?

What do they bring?

Students bring their knowledge of current classroom circumstances and set up in identifying a problem.

Students bring varying degrees of ICT literacy.

Students bring limited awareness of 3D printing and design using 3D modelling software.

Students bring motivation to use technology as incentivised by prospect of being first in school to use the software and 3D printer.

What could the intended learning look like at this level?

Learning will following a sequenced unit of work based on the Design Thinking steps eg. Empathy, Define, Ideate, Prototype, Test

Students will work together to set success criteria for the project so they are able to critique their designs.

How will we know if they got it?

What evidence will enable us to assess the intended learning?

Students will demonstrate their learning by sharing their initial brainstorm ideas and presenting their designs to the class at the digital stage.

Students will test their printed products for effective design and ultimate functionality (can they hang a hat on the hook/can the hook easily attach to a wall and be able to support a hat).

How will we engage, challenge and support their learning?

Students will be given examples of other schools using 3D printing to create working solutions to problems.

Students will familiarise themselves with the software through a series of tutorials and self-guided exploration.

Students anticipated to require support will be partnered with more capable peers and can modify existing templates instead of creating designs from scratch.

So what will we do to get there?

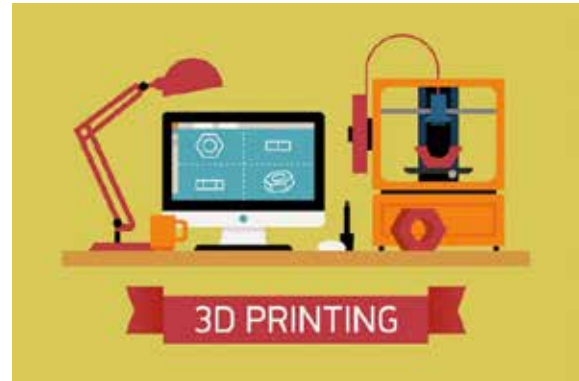
Design the teaching and learning plan

See Unit plan for 'Hooking Them in at Wandana'

3D Printing Design Criteria

What is 'design thinking'?

- > is a creative way to solve problems
- > involves stages:
 - Empathise – with your users
 - Define – your users' needs, their problem, and your insights
 - Ideate – by challenging assumptions and creating ideas for innovative solutions
 - Prototype – to start creating solutions
 - Test – solutions



What do you need to think about before you start designing? What criteria do you need to meet?

Safety (is it safe?)

Size/length (dimensions)

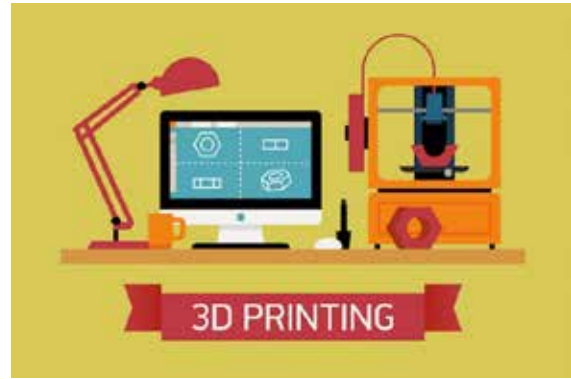
Position (where will it go?)

Aesthetic Value (what does it look like?)

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What do you need to think about before you start designing? What criteria do you need to meet?

Safety (is it safe?)

- safety ball on end of hook
- no sharp edges
- not too long or sticking out too much
- consider the angle of the hook

Size/length (dimensions)

ideas

- 22cm? – too big
- 5cm??
- height 5cm and 2.5cm across
- 1m from ground
- base area 12.5cm
- big enough to hold a school hat

Position (where will it go?)

- on a shelf (drill a hole, in cupboards)
- on a table or counter surface
- next to the door, on a wall
- **under the table, near edge of table**, use screws or velcro
- bluetack on wall, double sided tape on table
- wall in wet area
- 10 cm apart, spaced out
- not in same spot
- near the tables
- needs to be unattachable

Aesthetic Value (what does it look like?)

- put your name on it
- emoji or icon
-

3D Printing Feedback Sheet

Your group number and names _____

Date _____

Group	Positive feedback	Constructive feedback

Remember to check against the criteria...

Safety (is it safe?)

- safety ball on end of hook
- no sharp edges
- not too long or sticking out too much
- consider the angle of the hook

Position (where will it go?)

- under the table, near edge of table
- to use Velcro to stick to underside of table
- Extra challenge - to use clamp like design to the edge of the table

Size/length

- hook length ____cm
- hook width ____cm
- hook depth ____mm
- hook curvy part ____cm
- base ____cm x ____cm

Aesthetic Value (what does it look like?)

- Each group uses an agreed design as the basis for their hook, then each student can personalise it by putting their name/emoji/icon on it to identify it as theirs
- Consider symmetry/balance/smoothness of joins when joining two shapes

Printed Design Critique

Now that your ideas have reached their final stage of development and have become a real, working object, it's time to reflect on the design process and evaluate your product.

How well does your 3D printed hat hook meet the design criteria:

Safety (Are there any sharp edges/corners/protrusions that people could hurt themselves on? If so, were they part of your original design?)
/10

Aesthetics (Compare the printed object to your drawings and plasticine prototype and describe any differences in the appearance that have occurred. How happy are you with how it looks? Are there any rough surfaces or imperfect edges or joins from the printing that happened because the printer struggled with aspects of your design?)
/10

Size (How well does your printed version of your design fit onto the part of the table it needs to attach to? Were your measurements for your prototype accurate or did you have any issues in Makers Empire with measurements? Is it strong or flimsy and weak?)
/10

Overall functionality and economy of design (How well does your hook work? How well does it attach to the table, is it in the way or can it be knocked off easily? Does it do a good job of holding a hat? Does your design use more plastic and therefore take longer to print than it needed to?)
/10

How could you have improved your design? _____

3D Printing Self-reflection on the Design Thinking Process

Name _____ Other group members _____ _____ _____ Draw a quick sketch of your hat hook model... 	<p><u>Group work/collaboration</u></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Please rate yourself on (Please tick one)</th> <th style="padding: 5px;">Ex</th> <th style="padding: 5px;">Gd</th> <th style="padding: 5px;">Sat</th> <th style="padding: 5px;">Could have been better</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Listening to the group</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding: 5px;">Contributing to ideas</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding: 5px;">Compromising with your group</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><u>Comments</u> What did I do really well with my group? _____ _____ _____ _____</p> <p>What could have I have done better? _____ _____ _____ _____</p>	Please rate yourself on (Please tick one)	Ex	Gd	Sat	Could have been better	Listening to the group					Contributing to ideas					Compromising with your group					<p><u>Design Thinking Process</u></p> <p>1. What was easy about drawing the hat hook? <input style="width: 20px; height: 15px; margin-left: 100px;" type="checkbox"/> _____ _____</p> <p>What was challenging? _____ _____</p> <p>2. What was easy about making the hat hook using the plasticine? _____ _____</p> <p>What was challenging? _____ _____</p> <p>3. What was easy about designing your hat hook on Makers Empire? _____ _____</p> <p>What was challenging? _____ _____</p>
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AMAZING MODELS: Aidon, 8, Rebecca, 7 with their teacher Deanna Cammisotto, Emma, 9 and Jack, 8 and their 3D printed playground. Picture: MATT LOXTON

Inventions with a new dimension

REBECCA BAKER

MEET the aspiring young South Australian engineers and architects who are creating incredible 3D models.

The prototypes they are inventing are designed to solve real-life problems, from how to stop sand getting on to the school basketball court to creating a wheelchair-friendly monkey bar – and even protecting the groundsman's mobile phone from being run over by his mower.

Dozens of primary school students from across the state,

including Keith in the South-East and Kangaroo Island, have showcased their concepts at the Adelaide Convention Centre.

They are among students from about 50 SA schools taking part in a joint project between the SA Education Department and Adelaide-based education technology company Makers Empire, in which students use 3D print software to develop their critical and creative thinking skills.

Makers Empire chief executive Jon Soong said it was about providing children with

skills they would be able to use in the future.

Prospect Primary School technology teacher Deanna Cammisotto said her students, in Years 3 and 4, were concerned classmates with disabilities couldn't use – or were wary of – the main playground.

"The students asked their classmates what they'd like included ... they added things such sensory play areas (a music maker) and removed the bark, to allow wheelchair access and then created a playground to scale," she said.



Makers Empire
@MakersEmpire

Following



@JohnGardnerMP at today's #3Dprinting in Schools Showcase Day hosted by @edu_sagov. A wonderful celebration of #DesignThinking and #STEM learning in SA primary schools!



9:15 PM - 5 Jul 2018

<https://3dprintingindustry.com/news/3d-printing-news-sliced-cyber-nano-dimension-airbus-rolls-royce-autodesk-136062/>

July 12 2018

Showcase of 3D printing in primary schools

Over 500 teachers, students and invited guests attended the South Australia Department of Education's and Makers Empire's 3D Printing in Schools Showcase Day at the Adelaide Convention Centre.

The Showcase Day celebrated the 3D printing skills achieved as a result of the 3D Printing in Primary Schools Project – which began in 2016.

Approximately 50 schools were in attendance as they demonstrated ideas for 3D printing and 3D design-based solutions for real-world problems in their schools and communities. The primary school ideas ranged from a 3D printed name badge for a woman who had trouble remembering her nurse's name, 3D model planes for a former Australian Air Force pilot, and a 3D printed plant pot for avid gardeners.



Students from Mitcham Primary School holding up their 3D printing inventions. Photo via Makers Empire.

BLOG

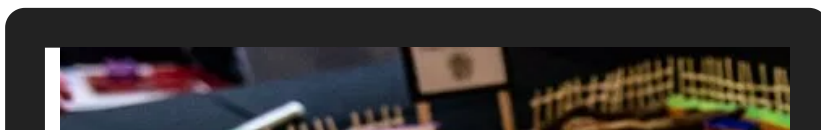
DEPARTMENT OF EDUCATION (SA)'S SHOWCASE OF 3D PRINTING IN SCHOOLS CELEBRATES LEARNING



Last Thursday, over 500 teachers, students and invited guests attended the **South Australia Department of Education's** and Makers Empire's **3D Printing in Schools** Showcase Day at the Adelaide Convention Centre.

Designed to celebrate the learning achieved during the **3D Printing in Schools Project (Phase 3: Part 1)**, the Showcase Day saw almost 50 schools come together to exchange ideas and feedback around the ways 3D printing and 3D design could be used to solve real-world problems in their schools and communities.

Check out some of the photos from the day:



Better Learning
by DESIGN 