



MacICT

Macquarie ICT Innovations Centre



Education
Public Schools



MACQUARIE
University
STONEY AUSTRALIA

Can we uncover the insights students' have into the potential value of **Augmented Reality** for learning by casting them as e-Design Artists? An investigation by *The Macquarie ICT Innovations Centre*.

SCULPT AND SHOW:

STUDENTS AS
E-DESIGN ARTISTS





Can we uncover the insights students' have into the potential value of **Augmented Reality** for learning by casting them as e-Design Artists?

For the past few years, the NMC Horizon Report has discussed the potential of Augmented Reality (AR) for learning, but has noted there is a lack of school based examples of its use.

MacICT decided to conduct a small, innovative school based AR project during Term 4, 2012 to provide insight into its potential value for education. The project's focus was upon the students; their values and interests, the nature of their learning experience and their appraisal of the transformative potential of AR.

The project involved a selection of students from a local High School coming to Macquarie University to learn about Augmented Reality and tour the Sculpture Park in the university grounds.

The students were invited to select a sculpture of their choice and then, using an Augmented Reality platform, Aurasma, design and create an aura that would be triggered by the sculpture.

This paper is a report of our investigation. It includes descriptions of each stage of the project, examples of students' work, insights from teacher discussions and our findings.

AUTHORS

Written by Dr Nerida McCredie for the Macquarie ICT Innovations Centre with contributions from Cathie Howe (Project Leader) and project participants.

This project was made possible by funding from the NSW Department of Education & Communities.

CONTENTS

PROJECT TEAM & SCHOOL INVOLVED.....	3
WHAT IS AUGMENTED REALITY?.....	4
PROJECT OUTLINE.....	6
STUDENT CREATIONS	8
Bridge: The Story of an Aura.....	10
Tana	12
Entropy	13
Algoïd.....	14
Achievement through Unity.....	15
PROJECT FINDINGS	16
SEE MORE.....	17

PROJECT TEAM & SCHOOL INVOLVED

Cathie Howe • **MaICT Centre Manager and Project Leader**



Cathie is a Professional Learning & Leadership Advisor managing MaICT. She is the creative and strategic leader of an expanding, collaborative team that develops professional learning workshops for teachers as well as a range of student workshops.

The teacher workshops focus on the challenges of designing learning that addresses content, pedagogy and the innovative integration of existing and emerging technologies in order to enhance learning and teaching across the NSW K-12 education sector.

All workshops are grounded in evidence arising from research into transformative pedagogies for 21st century learners and how technology enhances learning.

In collaboration with academic partners, Cathie pursues an innovative research agenda. Findings from research projects conducted through MaICT inform the education community & provide insight into new pedagogical approaches & the capacity of new technologies to enhance learning & teaching.

Cathie also has expertise in building strong relationships and collaborations with a range of educational institutions and industry partners. Cathie has been involved in many research projects, including Researching Connected Communities 21, Augmenting Reality: Students as e-design artists, iPads in the Year 1 Maths Classroom, Game Design: Invasion of the ShadowPlague.

Dr Nerida McCredie • **MaICT Research Advisor**



During her 13 years of classroom teaching, Dr Nerida McCredie has been recognised for her work in digital learning and awarded for her innovative classroom practice. Her doctoral thesis explored students' insights into how they learn through design using technology.

Nerida now works as an educational adviser, trainer and keynote presenter. She is highly regarded for her dedication in working with students, teachers and principals to explore and create innovative ways to use technology for effective and lasting learning outcomes.

Project School

St Ives High School School

Sixteen students from St Ives High School joined the Project Team. These students, from Years 8 to 10, were nominated by their teachers to participate and were a part of their school's Gifted and Talented Program.

Tania McGurgan-Ashdown, a Visual Arts teacher and coordinator of the Gifted and Talented Program, and Eliza Bowden, a Technology and Applied Studies teacher attended the AR symposium and workshop days with their students, and supported them as they design their projects.



WHAT IS AUGMENTED REALITY?

Augmented Reality (AR) links digital content to physical content, allowing a person to see the real world with virtual objects superimposed (layered) over it. Examples of virtual objects may include, sound, video, graphics or GPS data.

Using a smart phone or tablet loaded with an AR viewer app for example, Aurasma, Layar or Junaio, viewers can experience an augmented reality scenario once the app has recognised the trigger that launches the AR experience. The trigger may be an image, symbol, object or location.

AR doesn't replace our physical world but supplements or augments real world environments. It is not just a faster or more convenient way to get information in the real world, it enables us to see the physical world in a different way, extending our imagination and understanding of reality. AR allows us to display information in a way that was never before possible.





PROJECT OUTLINE

In mid August, two students from Year 8 and their Visual Arts teacher, along with Nerida and Cathie, attended an Augmented Reality Symposium at MacICT. The workshop, was run by Danny Munnerley and Matt Bacon from the team at AR Studio, located in the University of Canberra INSPIRE Centre, and Rob Manson and Alex Young both co-founders of buildAR. They introduced the Project Team to the history of AR and provided a showcase of how AR can be used to transform education. The presenters also explained from a technical point of view how AR works and provided some hands on opportunities for the team to experience and create an AR activity.

Chris In October, the Project Team grew to contain thirteen more students from Years 8 to 10, and another member of staff from the High School, a Technology and Applied Science teacher. The original Project Team ran a one day workshop for these new members, covering much of what they had discovered during the symposium, as well as hosting a workshop exploring a selection of digital visual art activities and a discussion about the teachers' and students' experiences of learning with technology.

The following week, the Project Team came together to spend four days designing and developing AR projects in response to a selection of sculptures in The Macquarie University Sculpture Park.

The week started with a tour of the park. Leonard Janiszewski, a curator from the gallery, spent time with the Project Team, sharing with them the history of the park and taking them to see a selection of the sculptures. That afternoon, planning the students chose a sculpture they would like to design for – most choosing to work in a small group, though a few did decide to work individually on their project. Together, the team discussed imaginative ways that they might enhance a visitor's experience of a sculpture using Augmented Reality.

To create their AR projects, the Project Team were provided with accounts at Aurasma Studio. There they could create a channel where they could organise and host their auras. The team spent Monday and Tuesday in at MacICT. This gave them easy access to the sculpture park and to video cameras and a blue screen for filming. Having collected the images and film they needed, the team returned to their school on Wednesday and Thursday to complete and publish their designs.



The Project Team created videos, animations, audio tracks, links, surveys, commentaries and interactive menus using iMovie, Photoshop, Adobe After Effects, Adobe Premier Elements, Keynote, Survey Monkey and GarageBand.





STUDENT CREATIONS

The students in this project created a wide range of Augmented Reality auras for eight different sculptures.

To explore their work, please download the Aurasma App for your smart phone or tablet. Once you have installed Aurasma, subscribe to our channel: Macquarie Uni Sculpture Park – students as e-design artists. We suggest you search by the term ‘e-design’ to quickly locate our channel.

Download these trigger images, launch Aurasma on your phone or table and you will be able to explore the auras these students designed.

Included in this section is a detailed account of the steps two Year 8 boys took to imagine, design and create an aura for the sculpture **Bridge**. Four other accounts of students’ projects have been included:

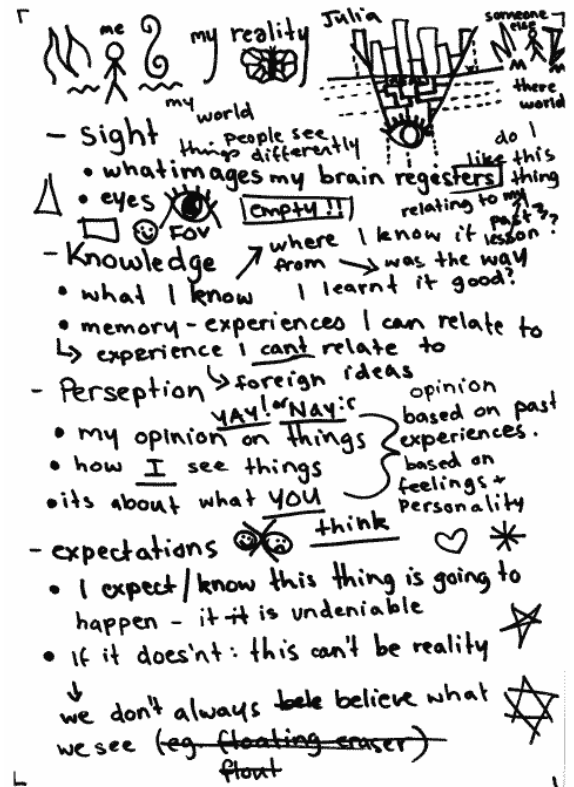
Tana

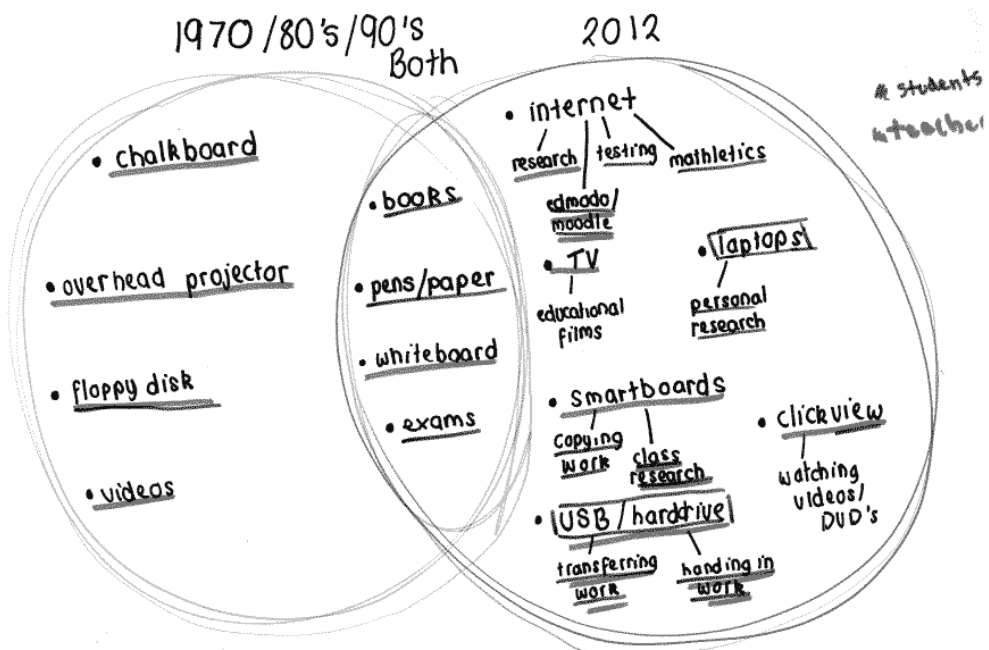
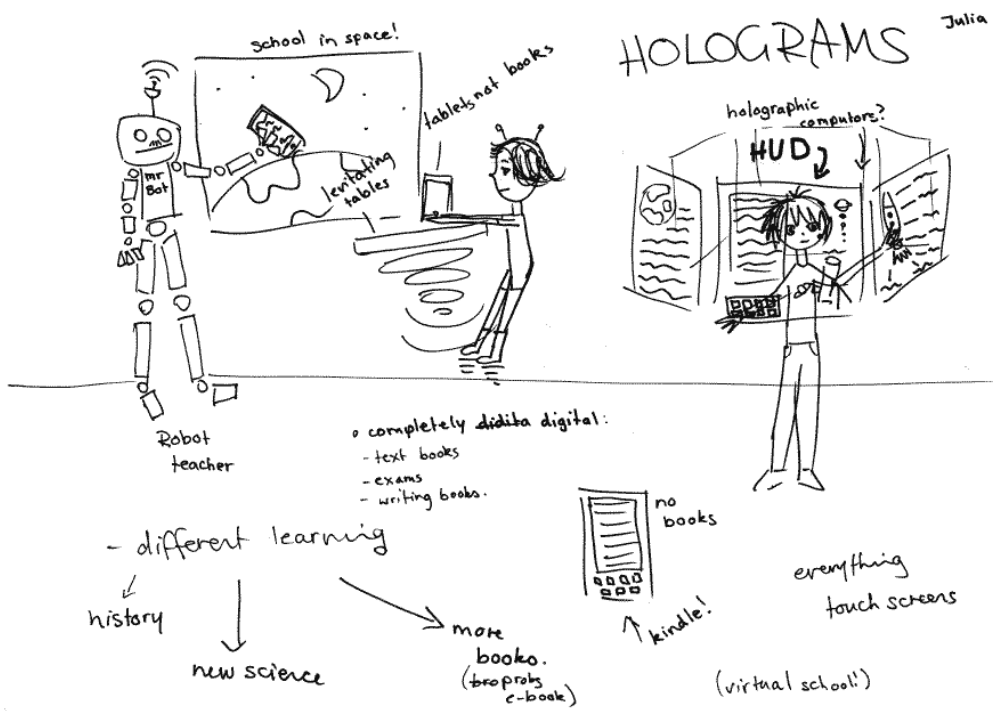
Entropy

Algoird and

Unity through Achievement.

These accounts showcase the work of the students and also include a review of their work by their Visual Arts teacher Tania McGurgan-Ashdown.





BRIDGE: THE STORY OF AN AURA

James and Chris's Aura for 'Bridge' by John Petrie

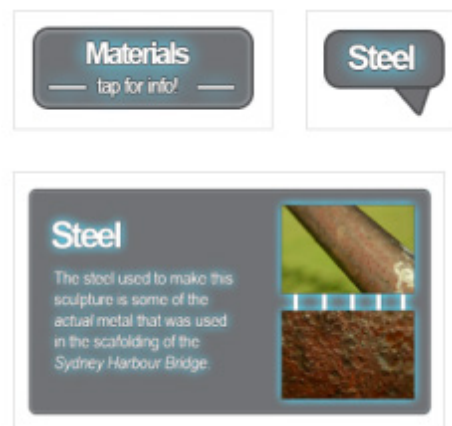
Chris and James teamed up to create an Aura for Bridge, a sculpture created by John Petrie. This was one of the sculptures that Leonard Janiszewski had taken the students to during their tour of the Sculpture Park.

Having selected this artwork, the boys spent time out on the lawn taking photographs of it from many different angles. James, a student of photography, brought his own camera in to ensure he was able to capture the shots he was looking for. The boys also went online to find out more about the artist and the materials that had been used to create the sculpture.

James and Chris then worked together to simultaneously envisage and design their aura. They created a digital mock up, discussing and imagining what features they would include in their aura as they designed the layout of the interface. A consistent look and feel to their aura, and the development of a seamless experience for users, was of equal importance to the boys as the quality of their aura's content. James brought his laptop in from home to use design software that he was familiar with and together they decided on the interface below.



A mock up of the Bridge's interface

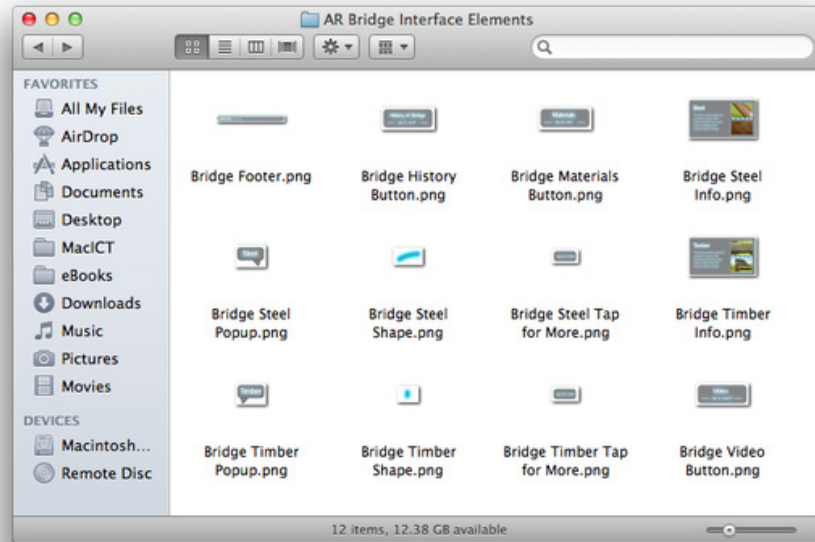


Buttons for the Bridge Aura

The boys were very pleased with their design. They had decided that a tap on the History of the Bridge button would overlay the sculpture with a photograph of the Sydney Harbour Bridge while under construction. A tap on the Materials button would launch the secondary Steel and Timber buttons that users could select to find out more about the construction of the sculpture. Tapping the Video button would allow users to watch a video of the boys discussing their selected sculpture.

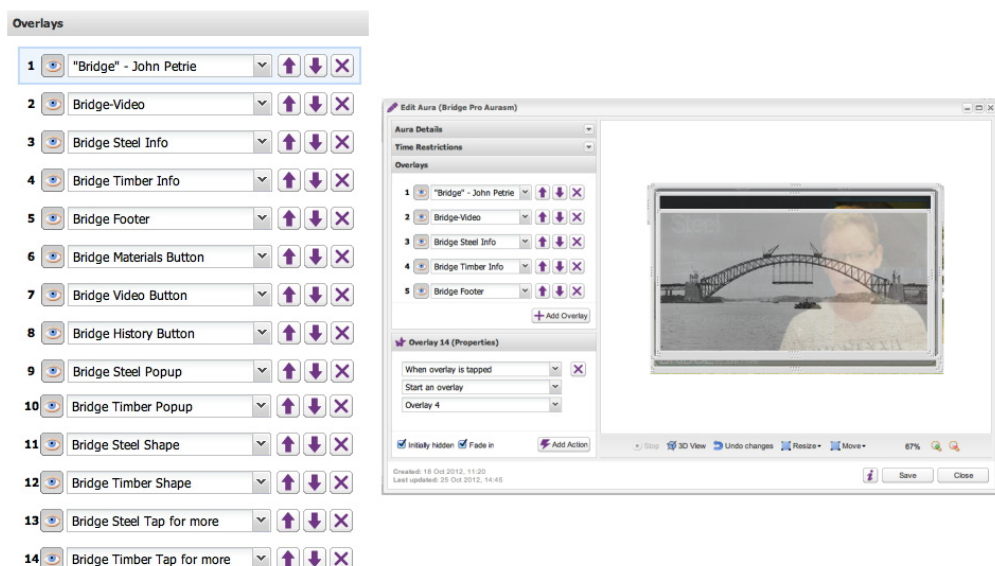
Chris and James now went about systematically constructing the elements they had planned for their aura. Chris went online to further research the history of the Sydney Harbour Bridge and select a historic photo of it to use in their aura. He also investigated in more detail the interesting facts about the materials used in the sculpture to be included in a pop up graphic. While he was doing this, James meticulously created the images they would need to include in their aura, such as buttons, graphics and information tiles.

The thoroughness of the boys' detailed planning can be seen in the consistent approach they took to naming and organising their graphics. Did they anticipate the value such a systematic approach would have when it came time to program and sequence their aura using these elements in Aurasma Studio?



While James was finalising the graphics, Chris started work on the script for their video. James joined him and they finished it together. Using one of MacICT’s video cameras and the blue screen, the boys took turns filming each other’s part of the dialogue. They had discovered from their research that sunshine and shadows had a key role to play in how people might appreciate and interpret Bridge. The style and content of their video, including questions and suggestions for their audience, acknowledges that while the boys could rightly anticipate that their audience would be situated at the sculpture, they could not predict the time of day a user might launch their aura or the weather conditions they would find themselves in. The boys showed their awareness of this by creating a video element that would be applicable to any user’s reality.

It was now time to upload their elements to Aurasma Studio and create the aura. The boys selected their trigger image. Creating a channel in the project’s account, they then uploaded their images as overlays, and placed them over the trigger image in such a way to match their mock up design. Each overlay then needed to be programmed with specific properties so that it would appear and behave in the way the boys had planned. Below you can see, on the left, the list of fourteen elements that they included as overlays. Next to it is a screen shot showing how the interface allowed the boys to position each overlay and add properties to it.



James and Chris were very satisfied with what they had designed and created. They had successfully realised each of the elements they had imagined in their mock up and had correctly attributed properties to them so that people could interact with their aura in the way they had envisaged.

TANA

Julian's Aura for 'Tana' by Errol Davis

After our tour through the park, Julian selected the sculpture Tana by Errol Davis. While most students worked in a small group, Julian decided to create his aura alone.

Julian liked where Tana was placed and the way that it blended in with the trees. He thought it made good use of space and appreciated that it had many viewpoints. He described it as free flowing and noted that he found that appealing. Right away he had the idea of it emerging from the Earth and wrote, 'I may incorporate that into an Aura if possible – animation is difficult.'

It did take him several days, but using Adobe Photoshop and iMovie, Julian was able to create an animation of the sculpture slowly rising from the ground with a transparent background. The video below demonstrates how a viewer can touch a button to make Tana rise. While the video shows Tana rising in its original place, by tilting and turning a smart phone or tablet, a viewer can further augment reality by causing Tana to rise in other locations.



Tania's review of Julian's Aura

This was clever both technically and in subjective thought. He was determined from when he first saw the work that this was a response he wanted to communicate, I think for both its technical challenge and the subjective response it communicated to him. The strength of this whole project was of course this handing over of the creation of the learning activity to the students and the students really relished the power of expressing their own thoughts and ideas. I think Julian's is another example of this pleasure in being independent in presenting their thoughts and responses. I guess rather than having to listen to those of their teachers.

ENTROPY

Georgia, Daniel and Nikhil's Aura for 'Entropy' by Anthony Pryor

Georgia, Daniel and Nikhil chose to design for Entropy by Anthony Pryor. Georgia had a strong emotional response to the artwork, commenting that it made her feel warm and fuzzy on the inside. She was attracted to the number of elements included in the sculpture and its depiction of weather. Georgia liked that the sculpture was in a high traffic area and thought it would provide her group with many creative possibilities: 'I was intrigued as to the many effects I could apply to it and had wondrous thoughts of the many things we could change.'

The group worked together to create four overlays for their Aura. The first that is triggered is a layer of rain, thunder and lightening that plays on the screen of a viewer's smart phone or tablet. This significantly changes the reality of those visiting on a bright, clear day. Georgia, Daniel and Nikhil used Adobe Fireworks to create the effect. Once this overlay is complete, viewers can select from three buttons. One takes them to the week's weather forecast, one brings Georgia into the scene to share some details about the artwork and the final button launches an information video that plays full screen. The students used Adobe Photoshop to create buttons that they linked to websites and media files. Georgia was filmed in front of a bluescreen and the footage was then edited in Adobe Premiere Elements.



Tania's Review of Georgia, Daniel and Nikhil's Aura

This connection was clever and fun! and yet so obvious I suppose, but again it engages the audience and maintains that the viewer is learning and understanding more about the work. (I found it took people a moment to connect the weather effects to the sculpture, it required them to really look at the work and identify the connection. I was impressed by the link to the daily weather... this is a true gen x/z approach, almost "app" like in its inclusion... This is a evidence of the power of the students devising these learning activities, they are connecting to a culture significant to them.

ALGOID

Rachel, Susie and Sammi's Aura for 'Algoïd' by Errol Davis

Rachel, Susie and Sammi had a very strong emotional reaction to 'Algoïd' by Errol Davis. They decided to design an aura for the sculpture that captured how they felt. The girls wanted to create an aura that was mysterious, intriguing and even spiritual in nature.

Susie wanted to include sounds that were loud and shocking to scare people and Sammi pictured an angel or spirit coming up from a grave. To create this effect, the girls rattled the sculpture and recorded the sound it made. Rachel was filmed mimicking an evil angel in front of a blue screen.

Using Adobe After Effects CS6, they then edited and adjusted the footage to create a series of short, startling clips of a dark angel appearing from out of the sculpture.

Rachel, Susie and Sammi were also curious about the name, Algoïd. They found out that it came from an Arabic word meaning evil star. The video that follows the Evil Angel aura explains how the girls wove together this meaning with their own translation of the shape of the sculpture.

Tania's Review of Algoïd's Aura

Needless to say this was an incredibly interesting interpretation of this sculpture. It was quite theatrical and the image speaks strongly to the audience. The visual interpretation is excellent and certainly engaged the audience. As an art teacher it is fantastic to see a visual image interpreted with another visual image! If that makes sense? This re- presentation of the sculpture is quite a sophisticated approach incorporating influences from the students responses to the sculpture which are then moulded by their own experiences (a true appropriation!) considering the image they ended up with was adapted from a pop culture movie.



ACHIEVEMENT THROUGH UNITY

Tom's Aura for 'Achievement through Unity' by Trevor Weekes

When Tom saw the sculpture Achievement through Unity by Trevor Weekes, he instantly selected it as his choice for marker and aura. He was struck by the feeling of unity and love between the two figures. He appreciated the contrast between the soft lines of their cloaks and the strong, stern lines of their faces, with their chins lifted in pride. The sculpture reminded him of Kings and Queens, of Lords and Noblemen. It prompted him to consider concepts such as honour, pride, leadership and responsibility.

Tom anticipated that this artwork would provoke in people a range of mixed feelings and ideas about its meaning. The first element of the aura he created was a video, that plays over the trigger image and sets out his interpretation of Achievement through Unity.

Tom's appreciation that other people were likely to view and understand Achievement through Unity in different ways to him shaped the design of his second aura element. Using Photoshop, Tom removed the sculpture from its location, leaving a silhouette window in the courtyard. This aura is able to become a frame around another image or scene. The button Tom programmed to launch this aura invites visitors to 'Change this reality. Slide a new image of unity under your camera.' The video below demonstrates how it is possible for each user to replace Trevor Weekes' sculpture with their own interpretation of unity.

Tania's Response to Tom's Aura

What an interesting subjective response this was to the sculpture. It was interesting that he chose to work on his own and was confident (in Year 8) to devise a learning experience that contained a strong individual response to the artwork. The story-telling like response I found thought-provoking as I did not initially jump to this train of thought. The deep thinking verbal presentation is sophisticated for this young student.

I absolutely loved the 'shell' technique that Tom used in his presentation. It moved on from his personal verbal approach to the work that to one that invited the audience to project their own imprint and interpretation upon it.



PROJECT FINDINGS

Can we uncover the insights students' have into the potential value of Augmented Reality for learning by casting them as e-Design Artists?

An initial examination of our project documentation suggests the students involved in this project successfully took on the role of an e-Design Artist. They demonstrated a deep level of appreciation for the artworks and created wide ranging, well considered, media rich responses.

The project indicates that students do have insights into the potential of AR for learning.

The students involved in the project perceive that learning with Augmented Reality has the potential to provide:

LEARNING OPPORTUNITIES THAT ARE BOTH INDIVIDUAL AND PERSONAL

The students shared their belief that AR is an individual technology. It allows the learner to be a part of what you are learning about. Learning with AR can make it real – you're not just sitting there and watching, you're actually doing something, not taking notes on how to do it. Moreover, in AR learners can experiment more, make mistakes and redo it, following their own line of inquiry. When learning using AR there is the potential see alternatives, to consider your options and the chance to explore your own choices, not pre-set choices.

LEARNING EXPERIENCES THAT AREN'T OFFERED (OR ARE READILY AVAILABLE) IN REALITY

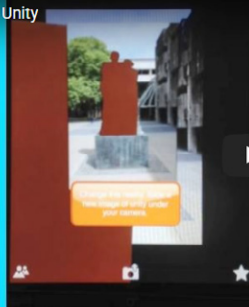

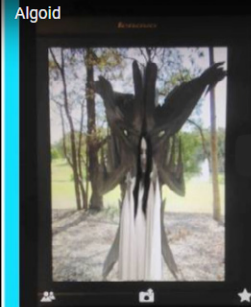






AR can add a layer of accessibility and enjoyment. One example the students discussed was the possibility of doing stuff that you wouldn't be able to do in a chemistry lab at school like creating virtual explosions or breaking apart igneous rocks, of being able to be in control and have access to a reality where you could cause no real harm. In such a learning environment, the students suggest they might be more inclined to try new things and that they would constantly be imagining new ideas.

CHALLENGING AND AUTHENTIC DESIGN BASED LEARNING TASKS

Designing Augmented Reality auras for the sculpture park at Macquarie University was challenging for our students, however they found that such a challenge makes you want to go in depth. Their creative responses were going to be shared with the public and this was of value to them – we are more excited about our own ideas instead of a textbook answer. Such a task was not like a worksheet where everyone has done it and it's nothing special. Instead, they were able to think differently and have 'their' own perspective. They appreciated when you design and create with AR, you can share it and be proud of it. The students reported that this made them feel that you're the clever one. They reported that a task such as this is so much more satisfying. One child commented that the AR project has helped me to think deeply about technology.

SEE MORE

Click the linked videos below to view a demonstration of each AR experience.

 <p>Unity</p>	<p>Sculpt and Show: Students as e-Design Artists</p> <p>Exploring Augmented Reality</p> <p>An aura for 'Achievement through Unity' created by Tom</p> <p>macict.edu.au</p> 	 <p>Algoid</p>	<p>Sculpt and Show: Students as e-Design Artists</p> <p>Exploring Augmented Reality</p> <p>An aura for 'Algoid' created by Rachel, Suzie and Sammi</p> <p>macict.edu.au</p> 
 <p>Entropy</p>	<p>Sculpt and Show: Students as e-Design Artists</p> <p>Exploring Augmented Reality</p> <p>An aura for 'Entropy' created by Georgia, Daniel and Nikhil</p> <p>macict.edu.au</p> 	 <p>Tana</p>	<p>Sculpt and Show: Students as e-Design Artists</p> <p>Exploring Augmented Reality</p> <p>An aura for 'Tana' created by Julian</p> <p>macict.edu.au</p> 
 <p>Bridge</p> <p>Sculpt and Show: Students as e-Design Artists</p> <p>Exploring Augmented Reality</p> 			

You can find out more about MacICT's case studies at:

www.macict.edu.au



MacICT

Macquarie ICT Innovations Centre



Education
Public Schools



MACQUARIE
University
SYDNEY · AUSTRALIA

WEB www.macict.edu.au
EMAIL macictsupport@det.nsw.edu.au
TWITTER @macict

MacICT
Building C5B
Macquarie University
North Ryde, 2109

T (02) 9850 4310
F (02) 9850 4311