

Macquarie ICT Innovations Centre



3D Virtual Worlds 3.0

Project Report 2011

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Macquarie ICT Innovations Centre is a collaboration between the NSW Department of Education and Communities and Macquarie University

About this report

Project team

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Schools involved

Iteration 3.1 – Trinity

Dulwich High School of Visual Arts and Design

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Executive Summary

About the Centre

The Macquarie ICT Innovations Centre (MacICT) is located at Macquarie University, Sydney, Australia. It is a collaborative agreement between Macquarie University and the NSW Department of Education and Communities (NSWDEC). The centre provides the opportunity for all K-12 schools to access innovative technologies in teaching and learning.

The Centre's focus reflects an innovative project-based approach to working with K-12 teachers and their students. The Centre's core business includes a comprehensive teacher professional learning and support program. MacICT staff, academic research partners from Macquarie University and school teachers collaboratively develop projects that utilise the most innovative, emerging technologies in education.

MacICT is also able to develop and implement small proof of concept projects to evaluate the use of new technologies quickly, providing feedback to our partners about the resource demands of scalability, for example.

MacICT is also able to connect and collaborate with other educational institutions and industry partners to inform the education community and provide significant research knowledge about the capacity of new technologies to enhance student learning.

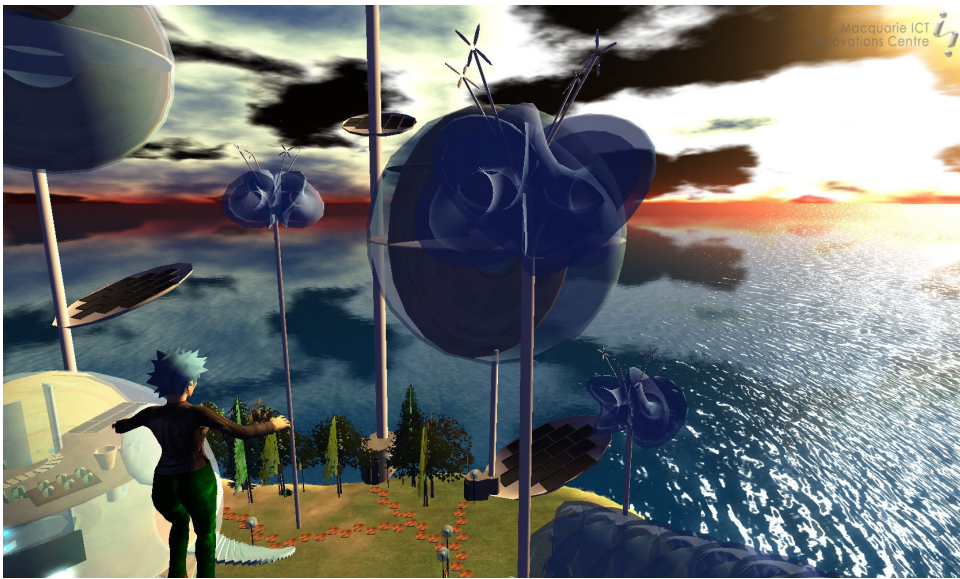
Mission Statement

'to develop, implement and evaluate innovative ways of enhancing learning through the application of dynamic and emerging information and communication technologies'

To find out more please visit our website at www.macict.edu.au and our blog at <http://web2.macquarieict.schools.nsw.edu.au>

Industry Partners





Project Rationale

This project aims to evaluate innovative educational applications of virtual world technologies, focusing specifically on activities that involve student construction within a safe environment. These activities are intended to provide students with curriculum-centred learning opportunities that involve deep engagement and higher order thinking.

Virtual worlds such as Quest Atlantis (Hickey, Ingram-Goble, & Jameson, 2009) and River City (Ketelhut, Dede, Clarke, & Nelson, 2006) have been successfully used in the primary and secondary school context to facilitate student learning. These virtual worlds present students with mostly pre-designed virtual worlds, which engage student in exploratory problem solving activities.

An alternative form of learning activity within virtual worlds is for students to design and construct virtual artefacts. This approach has been used by SCHOME (Gillen, 2008; Twining, 2009; Twining & Footring, 2008), Schoolaborate (2010) and MacICT (Cram, Hedberg, Lumkin, & Eade, 2010) for primary and secondary school students, and Mayrath, Traphagan, Heikes & Trivedi (2009) and (Fominykh & Prasolova-Førland (2011) for education at a tertiary level. The emerging research from these initiatives indicates that student design and construction is an engaging and effective method of facilitating

learning, however further research is required to advance our understanding of how students engage with these activities, and the conditions of success.

This project uses design based research methods (Design Based Research Collective, 2003) which are used to evaluate a series of virtual world implementations designed and implemented in collaboration with teachers in NSW Department of Education and Community (DEC) schools. Each iteration is evaluated to consider both practical and theoretical issues relating to student learning, teacher professional development and virtual worlds technology, with findings communicated to both teaching professionals and academics.

Strategy: Middle Years Strategy, 15-19 Years Strategy

Syllabus Addressed: Visual Arts, all other KLAs

State Priority Area: Connected Learning, Teacher Quality

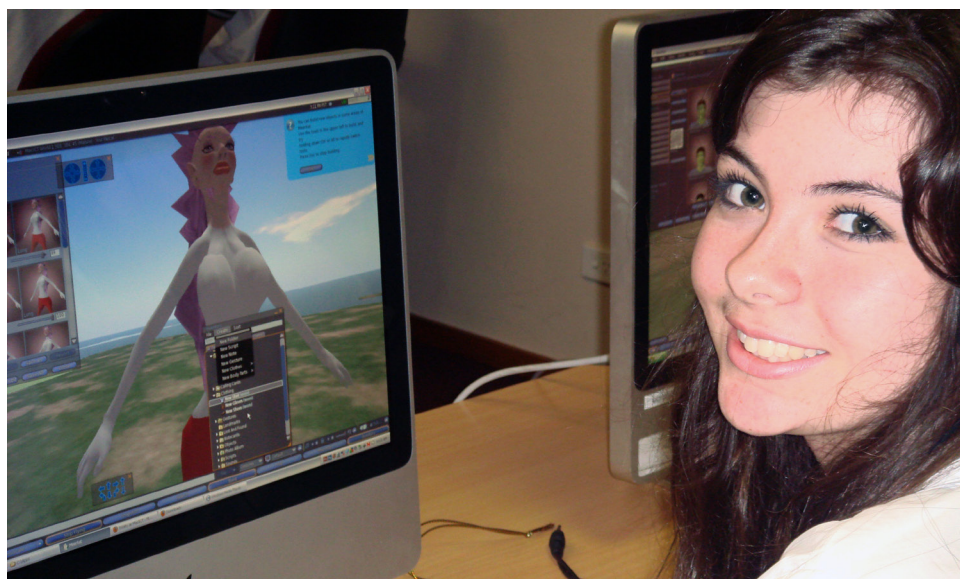
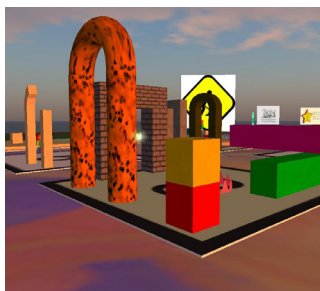
NSR Priority Area: to foster and lead differentiated learning; to develop authentic international relationships

Technology Requirements:

Desktop computers (such as standard DEC Lenovo workstations provided in 2010 rollout) with:

- 2048 MB (2Gig) RAM system memory
- A graphics card with shader model 2.0 support and 512 MB memory
- Latest OpenGL drivers and DirectX

The most critical issue for workstations to be compliant is video card support and virtual worlds browser combination.



Strategic Focus

This project links to the MacICT Strategic Plan 2011 in elements 1.1, 1.3, 1.5, 2.3, 2.4, 3.2, 3.3, 4.1, 4.2, 4.3, 4.4, 4.5 (*please see Appendix A*).

Conclusions from 2010

The 2010 project was significant because it evaluated completed units of work which used the OpenSim virtual worlds platform. In particular, the project evaluation considered how students' use of the virtual world construction tools to model designs impacted the students' design processes, development of spatial awareness and understanding of learning spaces. The evaluation also considered the viability of the Opensim technology, as well as the quality of the student training activities. In 2010, the project conducted three iterations, covering a range of year groups and Key Learning Areas:

Iteration 2.1: Student Created Artworks in 3D Multi-User Virtual Environments (MUVE) (Stage 5)

Iteration 2.2: Student Constructed Sustainable Learning Spaces in 3D MUVE (Stage 4)

Iteration 2.3: Student Constructed Sustainable Learning Spaces in 3D MUVE (Stage 3)

The evaluations found that the units of work were effective in assisting students to achieve the

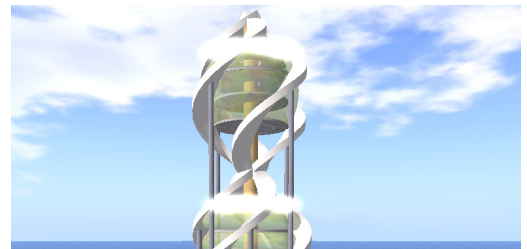
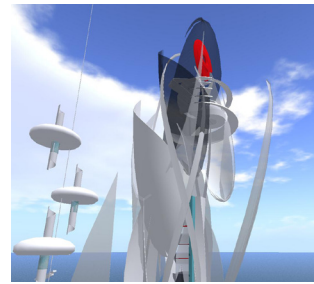
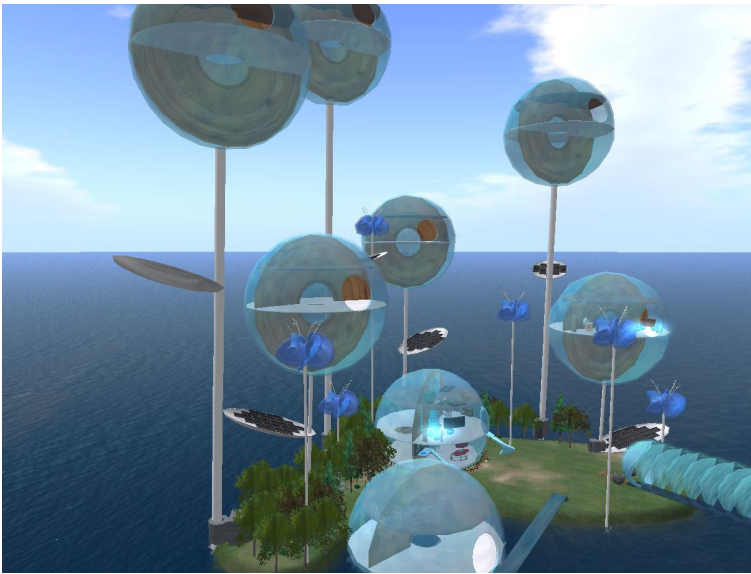
intended learning outcomes, while maintaining appropriate cyber-citizenship. Units of work also supported students on how to use the virtual world. The most significant issue identified in the evaluation was that while the classroom teachers felt adequately supported during the project, there was insufficient initial professional development to allow them to feel comfortable developing the unit of work and leading the students through the unit of work.

Project Objective

This project will continue to evaluate how design and construction activities within virtual worlds can support student learning for specific learning outcomes. The project will also focus on ongoing evaluation and refinement of the professional development approach for classroom teachers. Secondary objectives of the project are to integrate 3D display technologies with stereoscopic capabilities, and to engage students and teachers who have already participated in previous iterations of this project to capitalise on prior knowledge and skills acquired.

The project will draw on the findings of previous pilot studies and evaluations, including:

- Ensuring that classroom teachers have relevant professional development opportunities, strong support and sufficient time to understand how to create and implement a unit of work which



makes best use of the characteristics of the virtual world. This includes an appreciation of cyber-citizenship and classroom management.

- Providing teachers with access to the virtual world outside of classroom hours.
- Engaging students in ongoing reflection, through Edmodo, to support development of vocabulary and understanding.
- Implementing a 2 day student training session to assist students to learn how to build and manipulate objects, and to develop a culture of cyber-citizenship, within the virtual world.
- Providing training videos as supplementary support.

Student Direction

Students will have opportunities for open-ended inquiry and higher order thinking through completion of design and construction activities in a 3D environment. Through these activities, students will work towards the development of skills relating to independent enquiry, creative thinking, reflective learning and collaboration.

The virtual world activities will be developed according to guidelines produced through research into Quest Atlantis (Barab, Zuiker, Warren, Hickey, Ingram-Goble, Kwon, 2007).

- Involve students in a narrative that provides: “legitimacy to the content and student actions; a meaningful goal and set of actions; a background against which learner actions have some consequence; and a contextual framing that allows the learner to appreciate the use-value of the content to be learned.” (p. 4-5)
- Assist students to engage with the concepts to be learnt within multiple contexts, and in abstracted forms.
- Use analytic, rather than descriptive tasks.

Cyber-citizenship is an important priority of the project, with all students being required to follow the STAR code of conduct (Figure 1 below). Students are introduced to STAR before entering the virtual world for the first time, with consistent reminders and enforcement of the rules throughout the project.

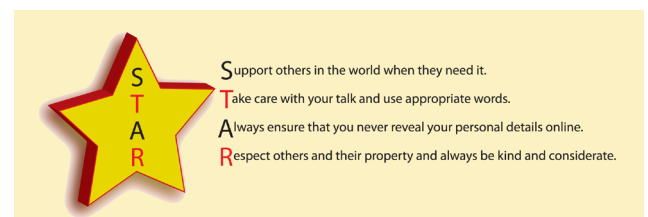
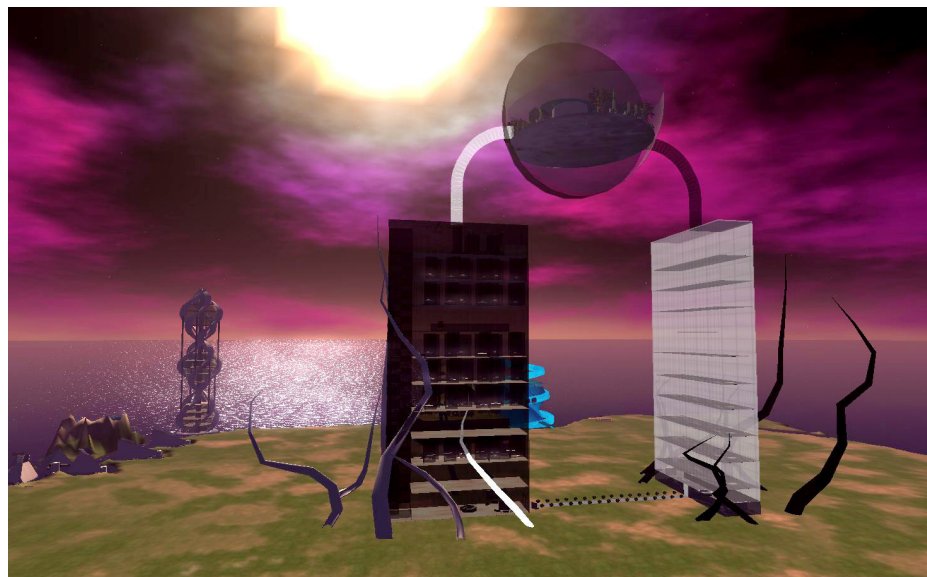


Figure 1. STAR: Rules for virtual worlds learning spaces

Students engage in self-reflection throughout the project using Edmodo, a secure social learning network. Effective reflection is modelled for students in the initial training session, with ongoing



feedback provided throughout the project to continue to guide students towards improved reflection practices. Students are encouraged to post reflections at the end of each lesson, including pictures of their virtual world designs. Students, teachers and project staff can also comment on students' Edmodo posts, providing collaboration, feedback and other support.

Teacher Professional Learning

School Participation Selection Process

It should be noted that in November 2010, expressions of interest were advertised and received from a number of schools wishing to participate in Trinity 2011.

From these EOIs, Dulwich High School of Visual Arts and Design was selected for the following reasons:

1. There was a perceived distinct advantage in working with the same teacher and students who participated in the 2010 iteration. The technical skills and training already acquired meant that we could leverage this to make considerably greater progress towards evaluation of student learning within the context of the curriculum rather than just the technology used;
2. The teacher at DHSVAD had already developed a unit of work and a scope for the design of the project as part of his expression of interest.

For the teacher to play such a significant and motivated role in the project design allowed the team to share the responsibility with the school rather than the teacher be reliant on the Centre for direction.

Professional Development

Participation in the Virtual Worlds Project will allow teachers to:

- Describe the potential of using virtual worlds to motivate and engage students
- Have opportunities for exploring pedagogical applications of virtual worlds through 'structured play'
- Develop programming and assessment expertise for units of work that include virtual world activities, within a supportive environment
- Learn techniques for encountering cyber-citizenship in a virtual world learning environment
- Evaluate and reflect on the use of virtual worlds in their Key Learning Area.

This project has been registered with the NSW Institute of Teachers and provides teachers with 17 hours of accreditation at professional competence level and will address the following Professional Teaching Standards: 1.2.4, 3.2.5, 4.2.4, 6.2.1, 6.2.4, 6.2.8, 7.2.1



Project Activities

NAME OF ACTIVITY	TYPE OF ACTIVITY	NO OF HRS	MY PL@DET COURSE CODE	COST (INCL GST)	PARTICIPANTS
3D Virtual Worlds PROJECT	Project	22	21374	\$55	Project Teachers
3D Virtual Worlds Training Days	F2f Workshop (2 x 5 hrs)	10	26754	\$110	All Teachers
Student Workshop	Student Training at MacICT	2 x 5	N/A	\$10 per student	Project Students
Student Workshop	In School Student Training	5	N/A	\$330	Project Students
3dedrats/ WHEN2050: Student Workshop	Student Training at SCA	2 x 4	N/A	\$15	WHEN2050 Excursion at Sydney College of the Arts
3dedrats/ WHEN2050: Public Workshop	Public Training at SCA	4	N/A	\$40	WHEN2050 Exhibition at Sydney College of the Arts

Participation Data

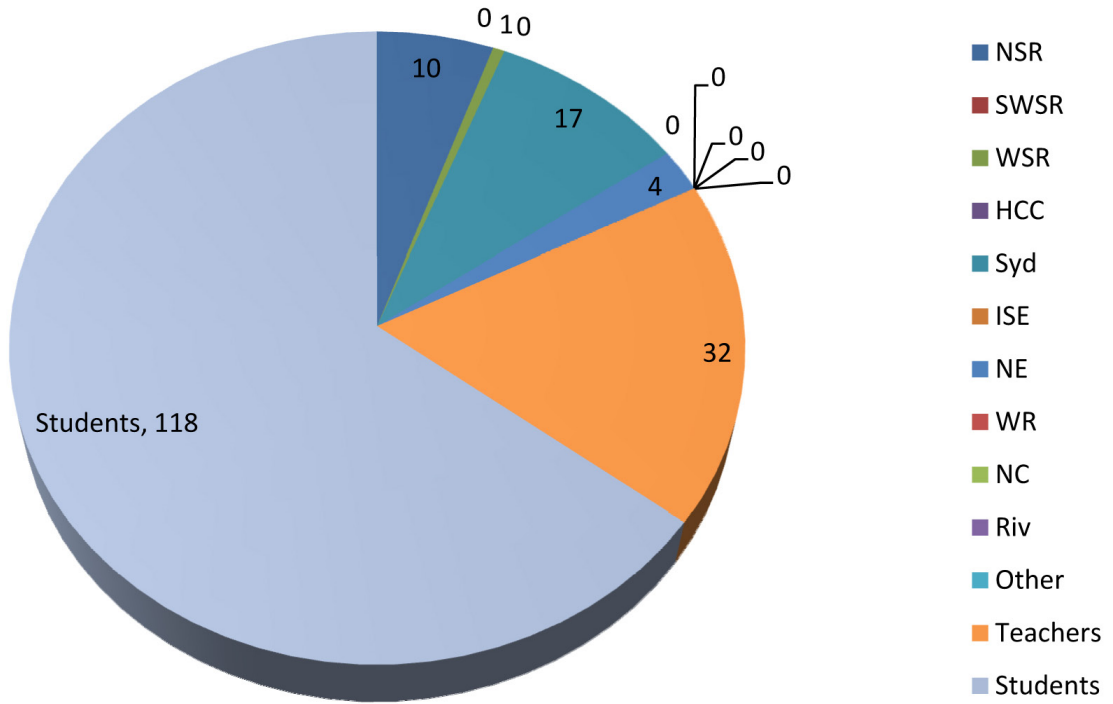


Figure 2. Participation figures 3D Worlds Project 2011

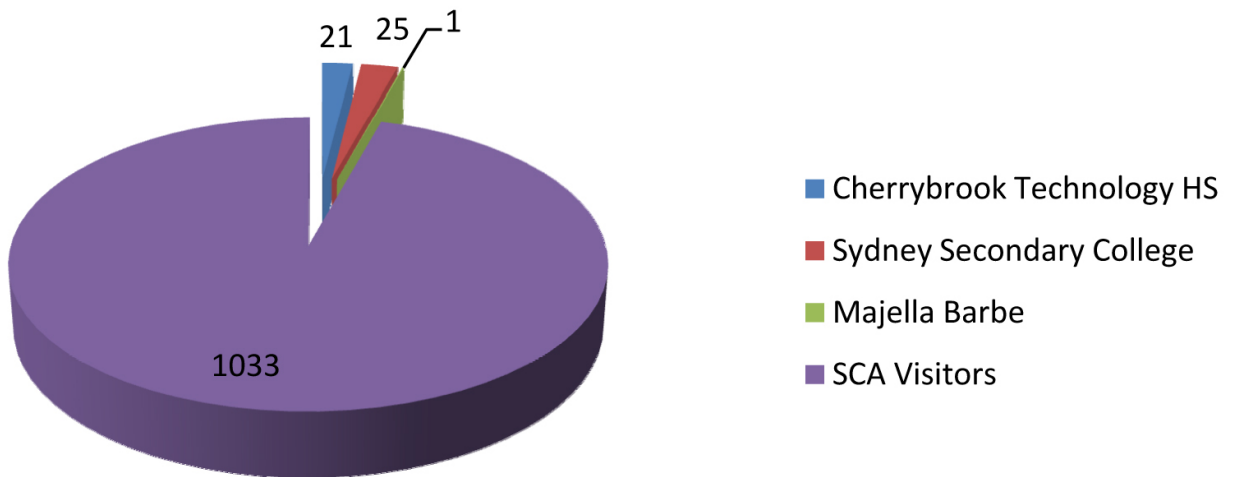


Figure 3. Visitor data WHEN2050 Exhibition, Sydney College of the Arts (SCA)



Iteration 3.0 - WHEN2050

Description

Iteration 3.0 involved 14 year 10 students from Dulwich High School of Visual Arts & Design (Dulwich HSVAD), most of whom had previously experienced design in a virtual world through participation in iteration 2.1 in 2010. In iteration 3.0, students developed Visual Arts architectural designs for Australian cities of the future (year 2050) that incorporated ideas of sustainability, aesthetic appeal and functionality.

We received high quality expressions of interest submissions from schools wanting to participate in this project. Iteration 3.0 was an example of a teacher who had clear rationale and goals for the project that identified how virtual worlds could be used to enhance learning and meet the subject outcomes and criteria.

The following learning outcomes were selected from the NSW Board of Studies Stage 5 Visual Arts and Design syllabus:

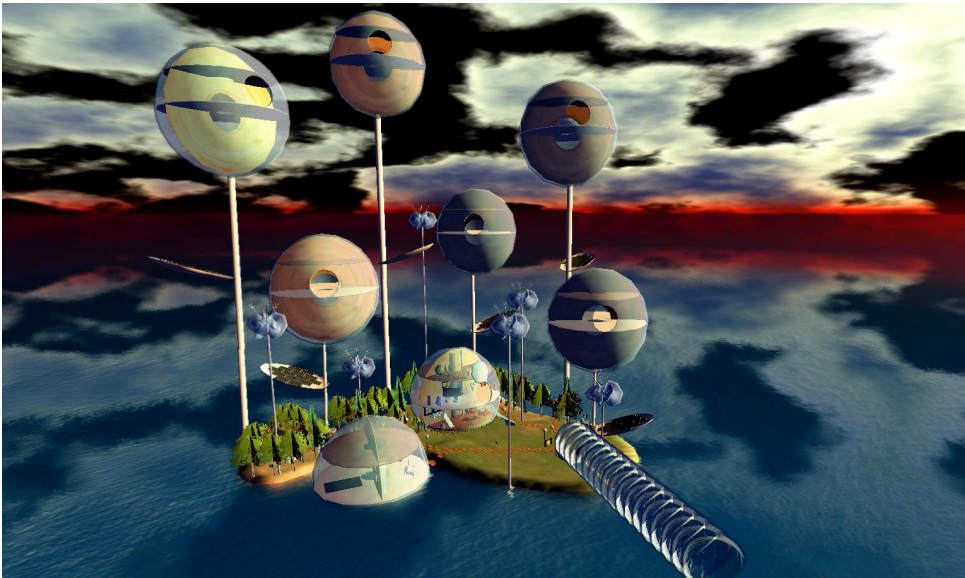
- RESOLUTION (5.6) demonstrates developing technical accomplishment and refinement in making artworks
- CONCEPTUAL FRAMEWORK (5.8) uses their understanding of the function of and relationship between artist-artwork-world-audience in critical and historical interpretations of art

- FRAMES (5.9) demonstrates how the frames provide different interpretations of art
- REPRESENTATION (5.10) demonstrates how art criticism and art history construct meanings.

Students worked from a design brief that required investigation of the Australian Institute of Architects Now + When exhibition at the 2010 Venice Biennale. Students explored the themes used in the Now +When project and selected one to base their project on. The task required them to explore the theme through brainstorming and research. The selection of a particular theme dictated the “world” their building would inhabit and the “look” of the final design.

The design brief consisted of three criteria:

1. The design must be based upon a concept used in the Australian Institute of Architects “Now+When” 2050 project for the 2010 Venice Biennale.
2. Issues regarding sustainability must be incorporated into the final design, for example waste, water and energy management, building placement and social sustainability in architecture.
3. The design needs to consider aesthetics.



The students not only based their designs on contemporary practice and futuristic musings, but were also required to have an appreciation of the foundations to building and architecture through the exploration of architectural forms in history: post and lintel, columns, arches, and domes. Key architects and styles were also surveyed and the philosophy behind them introduced.

Students initially spent three weeks learning about the architectural history and concepts, then completed the two days training covering use of the virtual world and Edmodo. In line with previous iterations, the training started with highly structured activities and advanced to ill-structured activities to allow for opportunities for creative expression and solutions. MacICT virtual world team conducted the second training session and monitored equipment performances at the school. This process was included this time to ensure that teacher and students had a working environment for the future. Online training videos for using virtual world tools were made available as support material for students and teachers during and after training sessions.

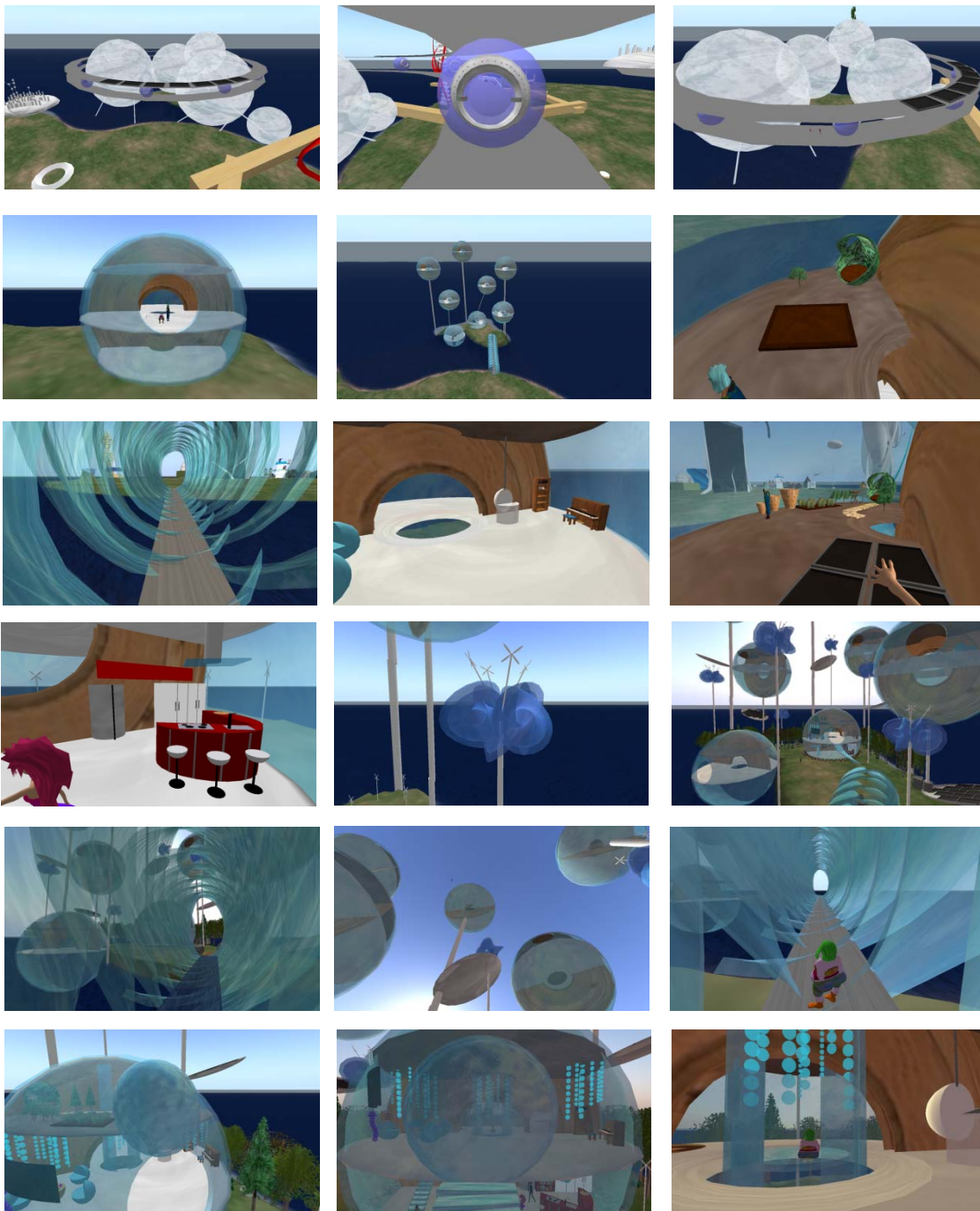
Alongside the training days, the students were presented with the design brief, formed groups of two or three students, and developed initial proposals for their architectural designs. Professor Richard Goodwin conducted a mentoring session with students, to outline his ideas about architectural design and to discuss and critique students' design proposals. After this, students

began developing prototypes of their designs, through sketches and by constructing in the virtual world. Russell Lowe visited the students to discuss how virtual environments can be used to evaluate spaces by simulating social activity within that space and to provide additional discussion and critique of the design ideas. After two weeks of prototyping, students finalised their design ideas and began construction of their final designs. Over the next three weeks students developed and refined their architectural designs. Students completed regular self-reflection through Edmodo. In the final week, each group finalised the design and completed design justification reports. Students spent approximately 10 hours on the initial lessons on architecture, 10 hours on training, then 35 hours in total designing prototypes and the final model and completing their reports.

Before the project began, the classroom teachers did some planning to prepare the initial lessons on architecture concepts and history. In weeks two and three, the teachers completed the Virtual Worlds Professional Development course, with two full days at the Macquarie ICT Innovations Centre. This course covered how to use the virtual world, as well as assistance for programming and assessment. Throughout the rest of the unit of work, the classroom teachers guided the students through the design process and provided ongoing feedback in class and through Edmodo. Teacher access to the virtual world from their school was provided outside timetabled lessons for duration of the project to give the teachers more confidence with using the software.

Sample Design Trajectories

This is a collection of screen shots which show the design progression of two groups.



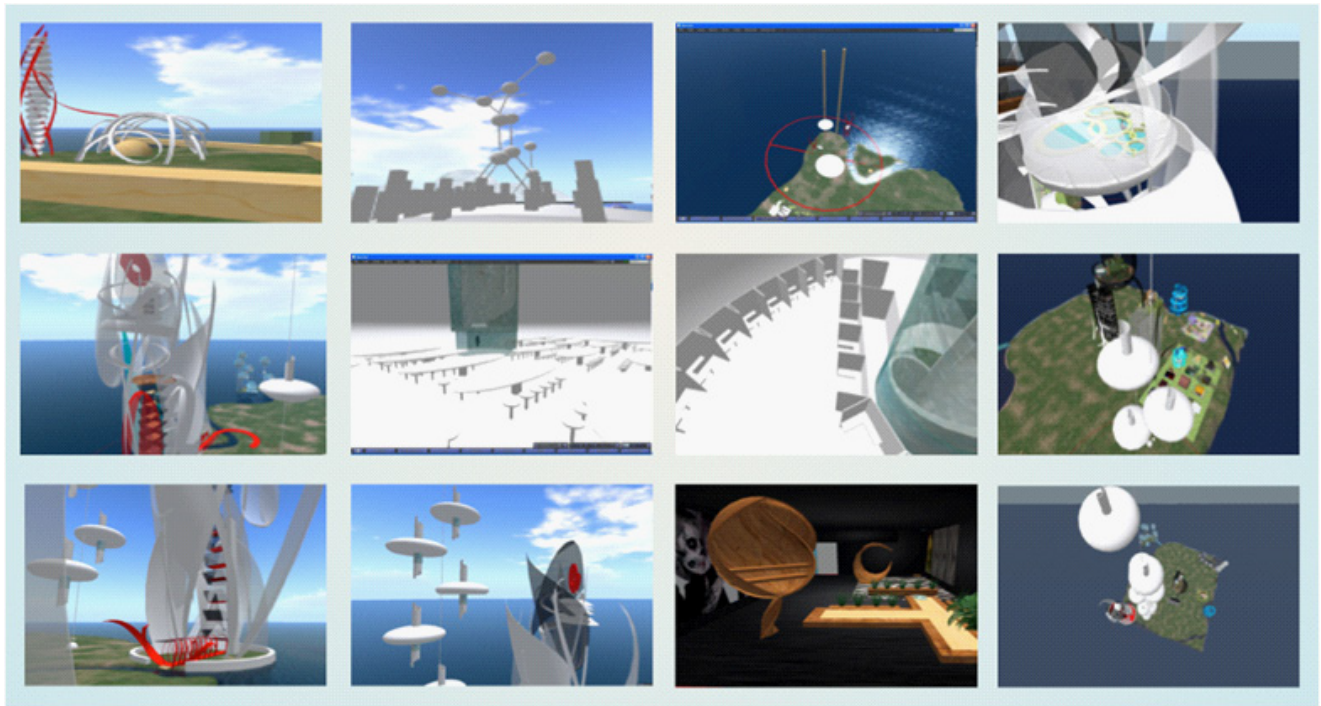
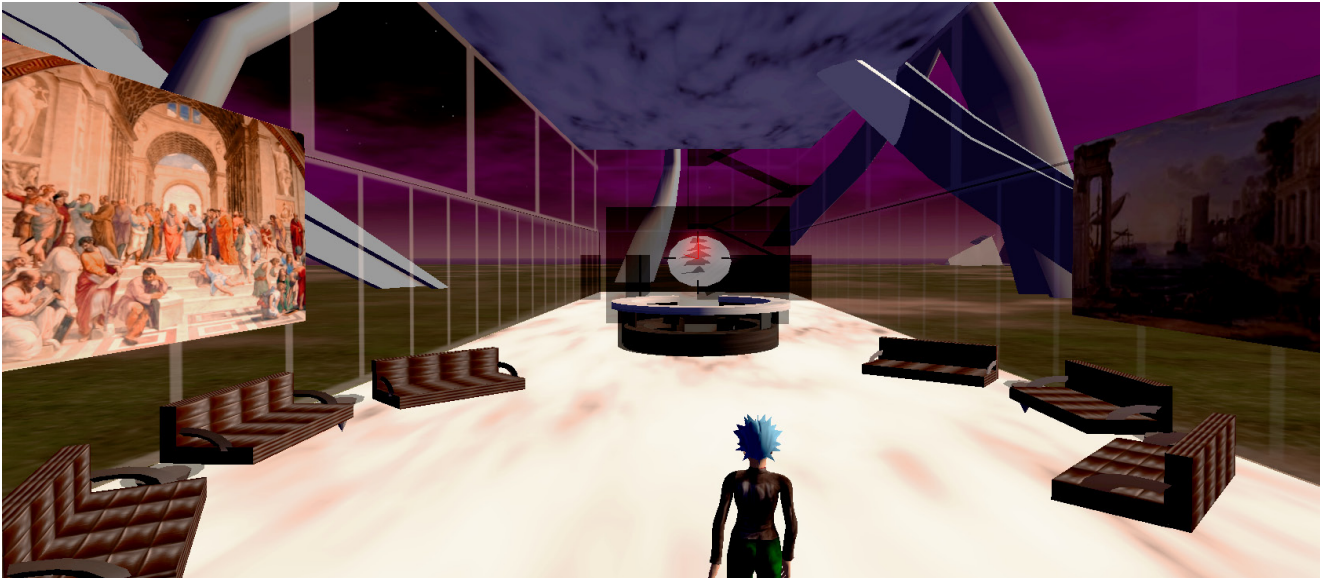
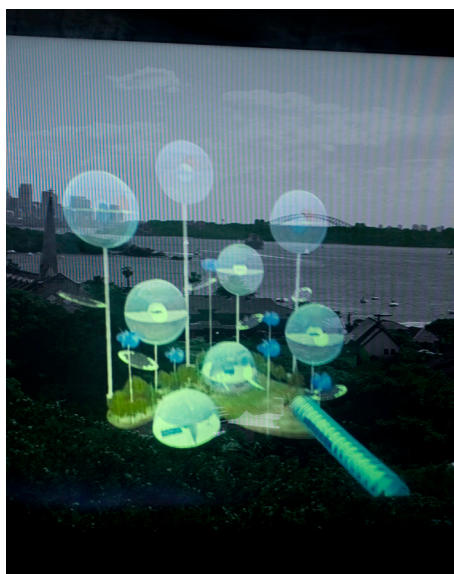
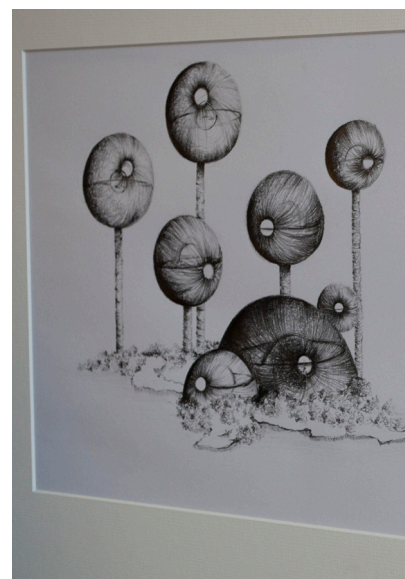
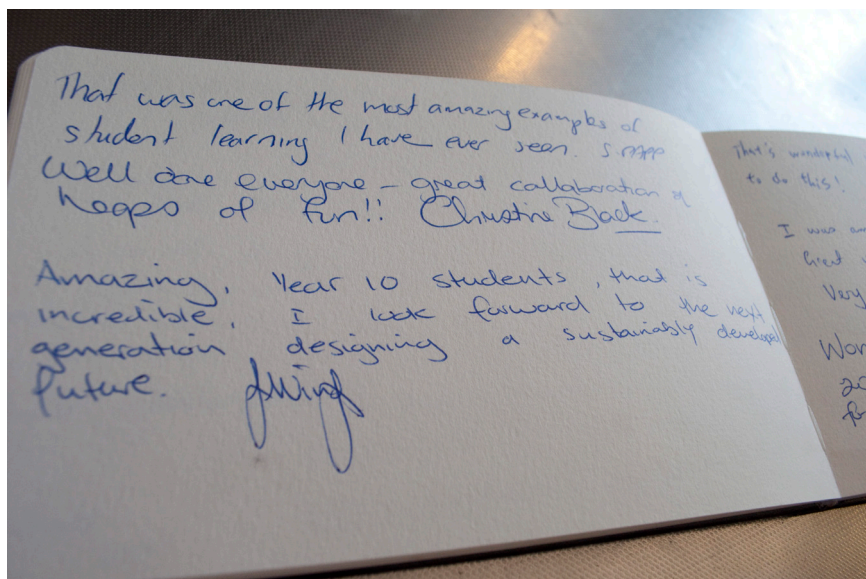


Figure 5. A Tale of Two Cities: (Jason and Paolo)



WEEK	1	2	3	4	5	6	7	8	9	10
Students	Initial learning about architecture			Complete training sessions and plan design solution		Develop prototype through sketches and in virtual world		Develop final design through sketches and in virtual world		
				Use Edmodo for reflection						Finalise design and write design justification and project evaluation
Teachers	Complete professional development course and develop programming and assessment for unit of work			Lead students through unit of work and provide feedback						
										Project evaluation

Figure 6: Unit of work outline and schedule



Feedback

Teacher evaluations from training workshops

"Extensive information was presented and many ideas discussed. Groundwork for project was well established."

"...learnt a lot about supporting software, programming and teaching strategies."

"It met my needs in unexpected ways such as consolidating other aspects of teaching which is not about learning a new technology such as brainstorming a new criterion for assessment of a non-typical project."

"All items for the day were achieved in a positive, enlightening and collegial environment."

Teacher evaluations from project

"...one of the most outstanding outcomes of When2050 has been the witnessing of all students being empowered through the use of the technology to produce their concepts. This empowerment through technology is liberating for the students as they are no longer restricted by skills (the means of expressing their concept) and are all on a level playing field to focus on the key task requirements of designing a building for 2050."

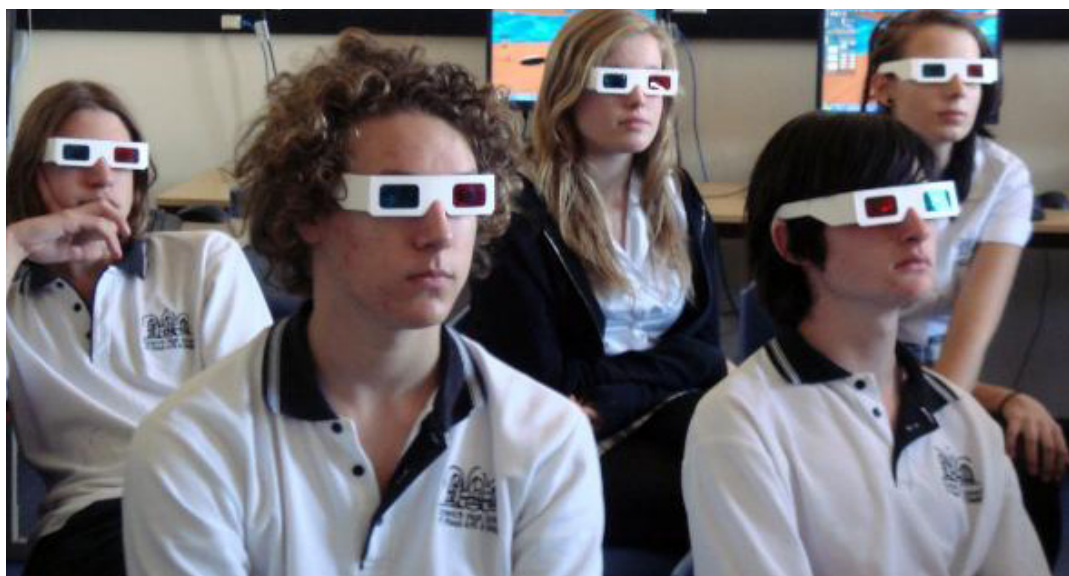
"The flow on from this is that all students have attained and maintained confidence, high levels of engagement and enthusiasm, strong communication and interactive participation/mentoring skills. Design outcomes have been outstanding in students being free to explore with few limitations or impediments to the realization of their ideas. In effect it is as if students are given free rein in a magical world where their imaginations can run freely ... and actually have their ideas "materialise"! There is an amazing educational advantage in using this technology that not only provides creative solution making competencies but also secures student engagement in quality teaching and learning parameters."

To read more about teacher reflections on this project, please visit our blog at:

<http://web2.macquarieict.schools.nsw.edu.au/journal/virtual-worlds/>

Student evaluations from project

"Its great being able to see your designs in a 3D point of view and to be able to actually stand next to your building and see the scale of your building. It has made me realise buildings don't have to just be a rectangle."



“Trinity was really helpful in developing concept designs. It’s easy to draw a sketch of an idea, but it’s more helpful to build a virtual model to better express ideas.”

“The most important things I learnt were how an idea can change so dramatically when applying it to the virtual world. When using the virtual world many complications occur and so your ideas have to change to suit the world. I also learnt how to create real life objects in the work. Also working on a project where we had to think about sustainability was very important. I learnt how to come up with new ideas that would be environmentally friendly.”

“Trinity has changed the way I design, as I now know how to manipulate and twist objects. To play around with new ideas no matter how creative they were, I was able to make it in the virtual world. I will now go to designing in the art room with a very open mind. This project has pushed me to work harder in developing my designs.”

To see the student’s work and hear their reflections on the project please visit our YouTube Channel:

<http://www.youtube.com/watch?v=g4akl13Jljc>

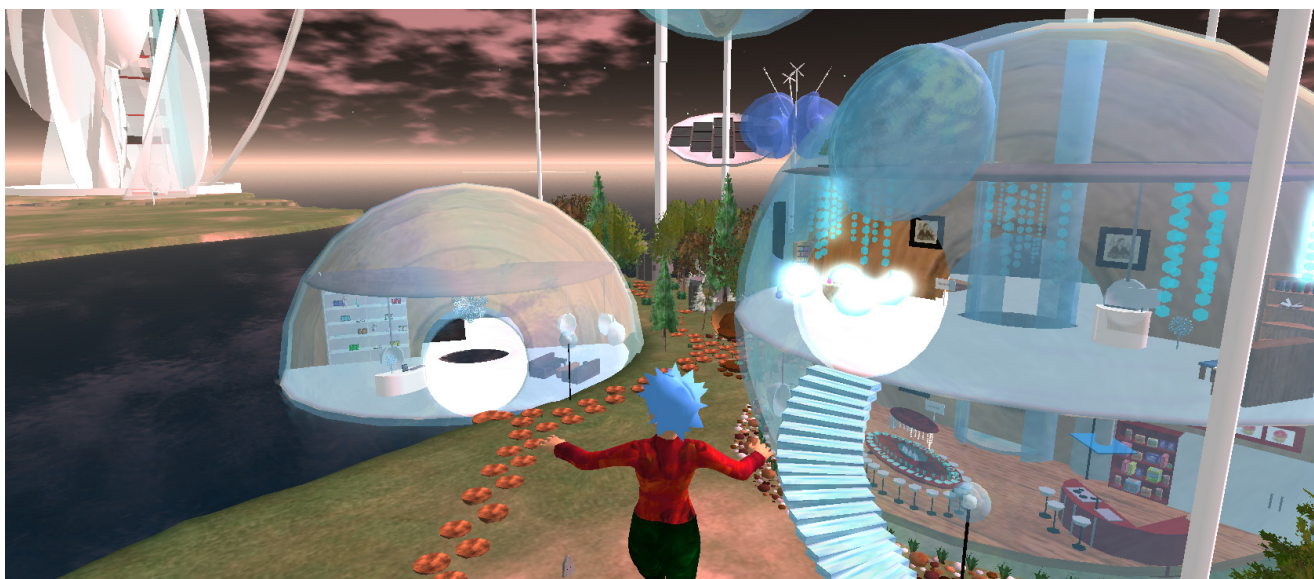
Findings

Professional Development for teachers

- The two training days for teachers at MacICT allowed teachers to learn how to use the software, implement Cyber Citizenship in the real and virtual classroom and to design a unit of work with rigorous assessment rubrics that clearly embedded virtual worlds within learning outcomes of the subject.
- The teacher reported that having access to the virtual world outside classroom hours increased his confidence in supporting his students.
- We extended our teacher training online using video and web conferencing technologies. This proof of concept demonstrates that teachers in remote locations can also participate in this project, provided there is sufficient bandwidth available on the school end.

Student training

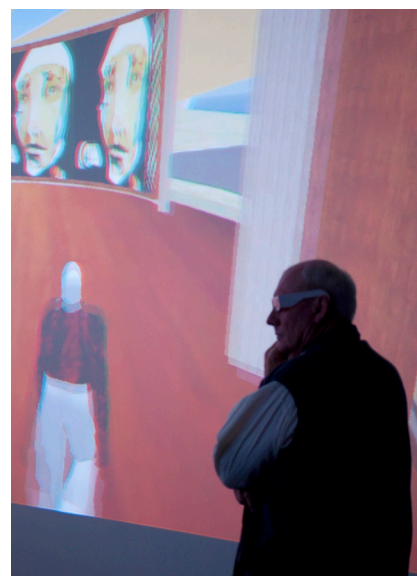
- 11 out of 14 students had used OpenSim from previous project participation. However, the three new students to OpenSim were able to quickly pick up the skills from the support of their peers. We found that the work produced by the new students were of a similar level of competence to the other 11 students who had previously experienced the virtual world.



- Clear goals at the start of training provided appropriate foundations for students to learn how to build, manage their inventory and understand alignment in the virtual world.
- The classroom teachers designed the third training activity for students (design a palace, shack or haunted house). This ensured that the training was suitably contextualised for the students, while providing the teachers with an opportunity to take ownership of the process and consolidate the professional learning.
- The high quality design descriptions and decisions in Edmodo demonstrated that Edmodo was used successfully:
 - to support collaboration within and between groups;
 - for critical reflection and planning;
 - for teacher and peer feedback.

Learning Outcomes

- 3D Multi User Virtual Environments (MUVES) provide opportunities for users (through their avatars), to experience the space within the environment which encourages development of spatial awareness.
- This iteration provided opportunities for students to develop leadership skills and become mentors for public workshops, WHEN2050 exhibition and World's Biggest Classroom exhibition. Students were asked to explain their ideas for their architectural designs and to demonstrate how to use the software to an audience which included teachers, students, education consultants, architects, tertiary students, university lecturers and members of the public.
- 3D MUVES provide **unique ways of learning spatial design through:**
 - **Iterative and rapid prototyping.** Users can create, develop and test their ideas and concepts quickly using the tools in the virtual world.
 - **Shared in-world perspective.** Students are able to communicate and share practices in this environment. This is further supported through Edmodo.
 - **Immersion.** Through avatars, students are re-embodied within the virtual environment, allowing them to inhabit and experience the space.
- Students were keen to experiment with scripting, and shared completed scripts via Edmodo and in-world chat and instant messaging. Additional support was required to assist students to understand the role of variables in the code.
- Assessment results indicated that students had successfully met the learning outcomes.



Conclusions

Implications for 2012

- The professional development, student training and ongoing support structures of this project are effective and replicable. We are now confident that the current structures used for this project are ready for deployment, with small modifications potentially required for local contexts.
- Continue to explore effective ways to support teacher and student training in remote areas.
- There is student demand for using scripts to make interactive designs, so there is scope for development of a script library resource.
- Continue to use Edmodo to support reflection, collaboration, planning and formative feedback.

The project is at a stage where we now have a comprehensive model for supporting teachers to design and implement virtual worlds units of work. There is also the potential to support teachers in remote areas for project participation. The student training program continues to work well with the movement from structured to ill-structured activities, providing strong guidance for students' introduction to the construction tools and then providing more opportunities for creativity and expression. Whilst the focus of this iteration was on Stage 5 Visual Arts learning outcomes, the project can be integrated into other key learning areas. The use of Edmodo for critical reflections allowed students to plan, design, revise, evaluate and justify their designs. The quality of the critical reflections by students using Edmodo was deep and rich, which demonstrated that students were able to confidently explain their design concepts and decisions.

This iteration clearly showed that 3D MUVES promote engagement and motivation. The student outcomes were reinforced with links to real world art practices in the form of public exhibitons.



Potential for development

In this iteration and prior iterations, the technical constraints of OpenSim and other infrastructure have restricted engagement to around 20 students. Recent developments of the OpenSim platform and related infrastructure have potentially reduced this restriction so that the virtual world may support a greater number of students in world at one time. The professional development, student training and ongoing support components already developed would provide a foundation for extending the scope of this project to involve multiple schools or classrooms at one time. This would be a valuable direction for future development, allowing investigation of student learning through inter-cultural collaboration, mentoring and cross-functional teams.

Appendix A: Links to MacICT Strategic Plan

STRATEGIC PLAN OBJECTIVES	PROJECT ACTION
Professional Learning	
1.1 Course and project evaluations will be highly rated and regarded	Iterative evaluation and improvement of project for both students and teachers participants.
1.3 Course and project evaluations will drive the directions of the projects	Ongoing technical evaluation for both MacICT and school environments. Ongoing evaluation of training sessions and school implementation.
1.4 Teacher candidates for deployment at MacICT will be of a high quality	EOI process for teacher deployment. Deployed teachers participate in two comprehensive training days prior to commencement.
1.5 Recognition and accreditation is available with all courses and projects	22 hours of accreditation for project completion. 10 hours of accreditation for course completion.
Students' and Teachers' Participation	
2.1 School participation in projects will be sustained throughout the course of the project	Student work from iteration 3.0 was exhibited at the prestigious galleries of Sydney College of the Arts, University of Sydney in October, 2011. Dulwich High School of Visual Arts and Design was also invited to exhibit the WHEN2050 project in The World's Biggest Classroom, School Spectacular 2011 at the Sydney Entertainment Centre: http://www.schoolsspectacular.com.au/2009/index.php?page=wbc
2.2 Improved data collection	Comprehensive collection of online surveys (pre and post) from students and teachers, student perceptions, work samples, final assessments, ongoing reflections. Edmodo, social learning network http://www.edmodo.com was used to facilitate data collection through scaffolded questions. Reflections from students and teacher were recorded during and at the end of project.
2.3 Online collaboration between teachers and students will increase	Closer integration of online collaboration between teacher and students, particularly in Edmodo. Teacher was more comfortable to interact in this space for this iteration.
2.4 An increased focus on middle years students in Centre projects	Student project participants were from middle years (Year 10).
Partnerships and Research Links	
3.1 Increased industry partnerships	Sydney College of the Arts, University of Sydney for exhibition space, Panasonic for 3D Stereoscopic projection, Lenovo for computers, Microsoft, DeHub and Studio of Applied Arts & Sciences
3.2 Increased collaborative research with University	Collaborative research with Macquarie University and University of NSW established. Joint research on article for Australasian Journal of Education Technology (AJET) Special Issue on Virtual Worlds.
3.3 Extend the current reach of the Centre, ideally across the State and possibly globally.	Presentation: "Learning by Designing in Virtual Worlds": Innovative Research in Virtual Worlds Conference Nov 3-4, Coventry University, UK. Ener Hax, Canada http://twitter.com/iliveisl Justin Clarke-Casey, OpenSim Developer, UK http://justincc.org Clive Gould, Bromley College, UK cliveg@gmail.com Barry Spencer, Bromley College, UK barry.spencer@btinternet.com Kevin Burden, Hull University, UK k.j.burden@hull.ac.uk Peter Twining, Open University, UK p.twining@open.ac.uk Derek P Robertson Derek.Robertson@educationscotland.gov.uk Sue Cranmer, Futurelab, UK sue.cranmer@futurelab.org.uk Peggy Sheehy, Suffern Middle School, US http://wowinschool.pbworks.com Mariam Malmstrom, Elisabeth Morrow School, US http://knowclue.wikispaces.com Lucy Barrow, Ballarat Grammar, VIC http://lucybarrow.edublogs.org

3.4 Continue to engage in sharing and discussion of research and innovation with online communities of educators	MacICT Innovative Teaching: http://web2.macquarieict.schools.nsw.edu.au Katy Lumkin blog: www.katylumkin.wordpress.com 3dedrats Festival: www.3dedrats.com Virtual Worlds Working Group (VWWG) http://virtualworldsworkinggroup.wikispaces.com/VWWG+publications Virtual Worlds – Best Practice in Education http://www.vwbpe.org
3.5 Partnership collaboration will inform direction of projects and professional learning	Partnership with Sydney College of the Arts in the month of October will ensure that the project work will be published at local and international levels.
3.6 Partnerships will include international research collaborations and linkages	Professor Stephen Heppell, Bournemouth University, UK.
Research Projects	
4.1 Focus on risk taking innovation to explore and explain pedagogical opportunities and to research pedagogical practices in specific disciplines	Link to research question for iteration 3.0 Evaluate how students' learning within design and construction activities is impacted by conducting these activities within a virtual world, with specific focus on: <ol style="list-style-type: none"> 1. the decisions that students make when completing the design and construction activities within a virtual world; 2. the social interactions that influence how the students complete the activities; 3. the architectural representations constructed by the students within the virtual world, and the use of avatars and multiple perspectives to test and refine the design ideas.
4.2 Research leadership will be strengthened	Collaboration with research academics from University of NSW.
4.3 Research support will be provided	Academic partnership with Macquarie University established.
4.4 Research productivity and accountability will occur through publications derived from each Centre project	Journal articles and conference papers under development for peer review and publishing.
4.5 Research productivity will be effectively translated into innovative teaching and learning practice	Project evaluation considers both theory and practice. Findings of the evaluations will be integrated into the 3D Virtual Worlds Project course as well as communicated through blog posts, reports and professional conferences.

Appendix B: Links to North Sydney Region Plan

NSR	PROJECT
Regional Targets	<i>Differentiated Learning Programs</i> Improve access to differentiated curriculum for all students; to develop authentic international relationships
Delivery strategies	<i>Middle/Later Years:</i> Video conference information sessions; two-day teacher training workshops which included design of unit of work, assessment tasks and rubrics; two-day student training workshops including concept and skill development; ongoing in-world student-centred activities using multi-user virtual world; mentoring workshops with architect Richard Goodwin
Assessment and evaluation strategies	Survey Monkey for student and teacher evaluations; Regular Edmodo student and teacher reflections throughout project; Student virtual work samples; Student and teacher video interviews 'About the Project' 3D video of fly through of Trinity. Culminating exhibition at Sydney College of the Arts.
Regional outcomes	All students access virtual learning technologies; Teachers adopt student-centred approaches to teaching using virtual learning opportunities; Students engage in authentic virtual learning; Students access authentic international relationships.
Regional indicators	Virtual learning technologies are embedded into student-centred teaching and learning activities

Appendix C: Quality Teaching Framework

STRATEGIC PLAN OBJECTIVES	PROJECT ACTION
Intellectual Quality	
1.3 Problematic knowledge	The task for iteration 3.0 required students to design and construct sustainable architecture for the Year 2050 in a collaborative online environment.
1.4 Higher-order thinking	Throughout the task for iteration 3.0 students were required to identify and resolve relevant design issues on sustainability and functionality.
Quality Learning Environment	
2.1 Explicit quality criteria	For iteration 3.0 students collaboratively designed and constructed within the virtual world, architectural designs that: <ul style="list-style-type: none"> • incorporated sustainability functions to meet the environmental needs for the future; • demonstrated an appreciation of holistic approaches to design including aesthetics, design solutions and social use of spaces
2.3 High expectations	For iteration 3.0 students demonstrated technical accomplishment, conceptual thinking practices and refinement in design and construction and made informed choices to meet the requirements of the design brief.
Significance	
3.5 Connectedness	For iteration 3.0 students worked collaboratively to design and construct sustainable architectural designs that met physiological and social needs. Students contributed through discussion and evaluation of the design process using Edmodo, a private online social platform for teachers and students to share ideas, files, events and assignment.
3.6 Narrative	For Iteration 3.0 students designed sustainable architecture for the Year 2050.

Appendix D: Technical Report

This project was completed using hardware and infrastructure as described and used in earlier iterations. With around 15 to 20 concurrent users and inclusion of in-world scripting, we noticed recurring access problems which included:

- Slow, jerky movements when avatars travel in-world.
- Occasional OpenSim crashes after 30 minutes or more periods of high activity.

Real-time performance analysis showed that the computer hardware resources were operating at or near to full capacity for extended periods and this would have been sufficient to account for the observed problems.

As our main server was operating on 32Bit, it was not possible to add additional useful RAM beyond the 4G already installed (the 32Bit OS can only effectively use a maximum nominal 3G).

The Dual Core Intel CPU was also operating at around 100% for extended periods - and averaging more than 70% utilisation over longer term periods.

The virtual RAM (on disk) was set at 4G but we found significant performance degradation (disk thrashing) if this amount was increased.

Ideally the virtual RAM should not be required as it always will result in some performance loss compared with 'real' RAM due to disk read/write latency. Our 'server' was a re-purposed desktop quality machine with single IDE and to RAID or similar redundancy in case of hardware failure.

As an insurance policy against system failure a scheduled disk imaging and rotation schedule was employed using three disks in scheduled rotation and one spare for ad-hoc needs.

On days where the school had scheduled incursion, we took a spare machine into the school with the latest 'snapshot' installed. This means that in case of server failure or loss of connectivity students were able to continue with in-world work. This is a bad solution but best available on limited funds.

The student enthusiasm for scripting has become a significant liability for both system performance and for reliability. A better outcome would provide both a development environment server and a production server so that scripting could be applied and tested before inclusion in the production environment.

Some tweaks were made to the scripting configuration to help optimise script performance, including ScriptDelayFactor = 0.0 set in OpenSim.ini

For scalability and to allow for a test /development environment would ideally involve at least two database servers and at least three OpenSim servers (a total of five servers, all of which could be virtual machines).

Our need to maintain Intranet-only access via NSW DEC Intranet precludes some options (such as cloud hosting) that would otherwise help solve the current hardware limitations.

Some trials were performed accessing Trinity using high-end workstation hardware and NVidia graphics system using polarised 3D and matching shutter glasses. The general 3D experience was good and provides a significant enhancement to the immersive experience. More work will be done on assessing how best to utilise in-world 3D viewing.

Currently, lack of hardware resources is the biggest barrier to progress.

LAN Trial with hardware upgrade

During October 2011 WHEN2050 exhibition at Sydney College of the Arts, a number of workshops were scheduled that required concurrent in-world access by 30 or more avatars. To support the increased number of users, new, improved hardware was supplied by Lenovo (ThinkCentre M91p, Intel Core i5-2400 Processor with 4G RAM).

Trinity (virtual world) was installed on the new server with all other variables kept constant (same operating system, configuration and OS versions). For the evaluation, all users were accessing the Trinity server via 1Gb LAN connection. The improved computing power was found to be sufficient to support 30 concurrent in-world avatars and building activities. System monitoring showed that all RAM and CPU resources were 100% utilised during peak periods of in-world activity and we would expect that 30 users would be the maximum practical number of users that could be supported.

DEC Intranet Trial (with 64Bit hardware upgrade)

In November 2011, a trial workshop was scheduled to replicate the workshop activities completed (above) as part of the WHEN2050 Exhibition.

The same Lenovo server was utilised with additional upgrade to full 64Bit Operating System (Debian Linux), and RAM doubled to 8G. The trial was run across the DEC Intranet under approval and monitored by DEC ITD. Detailed data was collected during the trial. Despite using the new, optimised resources, the practical limit was found to be around 15 - 20 simultaneous avatars in-world. The system was practically unusable when additional avatars were active - including very slow client response and regular lost connection resulting in need for users to lose data and having to re-login.

Broadband Trial (with 64Bit hardware upgrade)

In December 2011 the system used in 'DEC Intranet Trial' was connected via broadband Internet to a remote site. The system was accessed concurrently by 48 remote users and 20 LAN users.

The eight core Intel CPU was also operating at around 50% for extended periods - and averaging at 35% utilisation over longer term periods.

The physical RAM of 8G was sufficient to provide services with no overflow/swap-out to virtual RAM required.

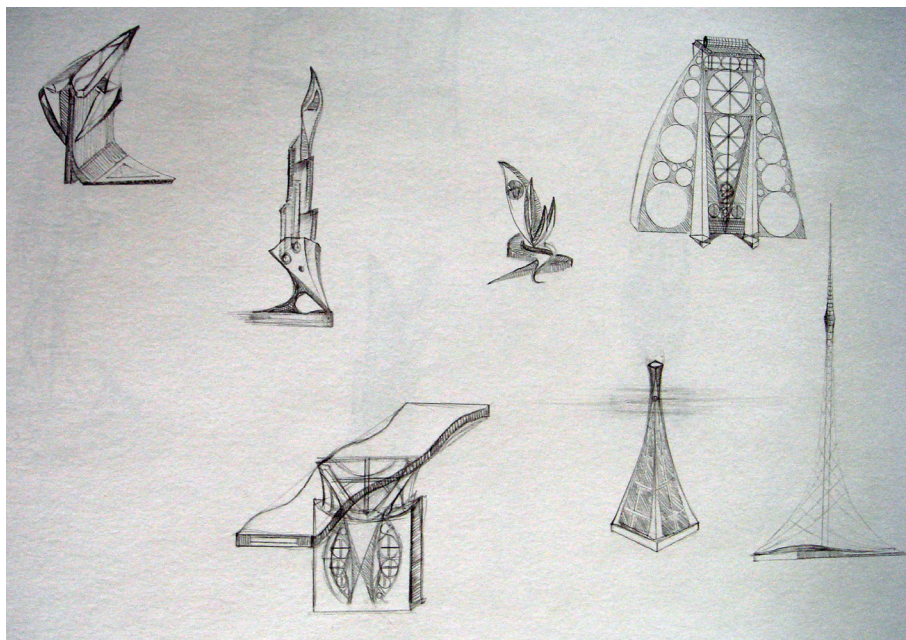
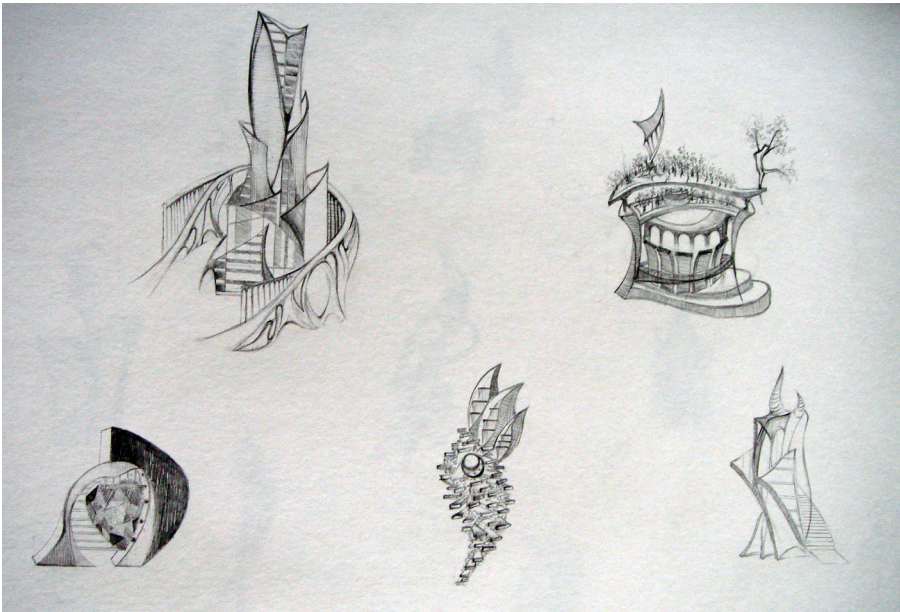
Results of the trial indicate that entry level server hardware may well support 50 to 100 avatars concurrently active in-world.

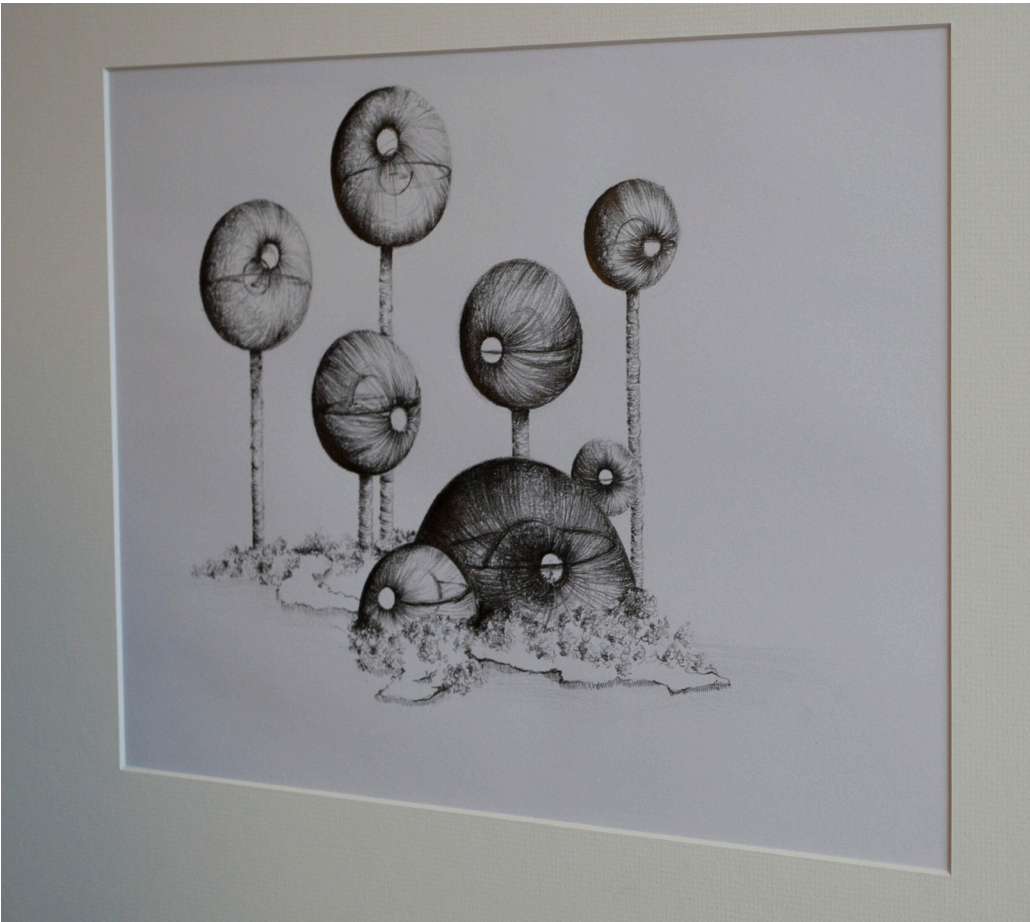
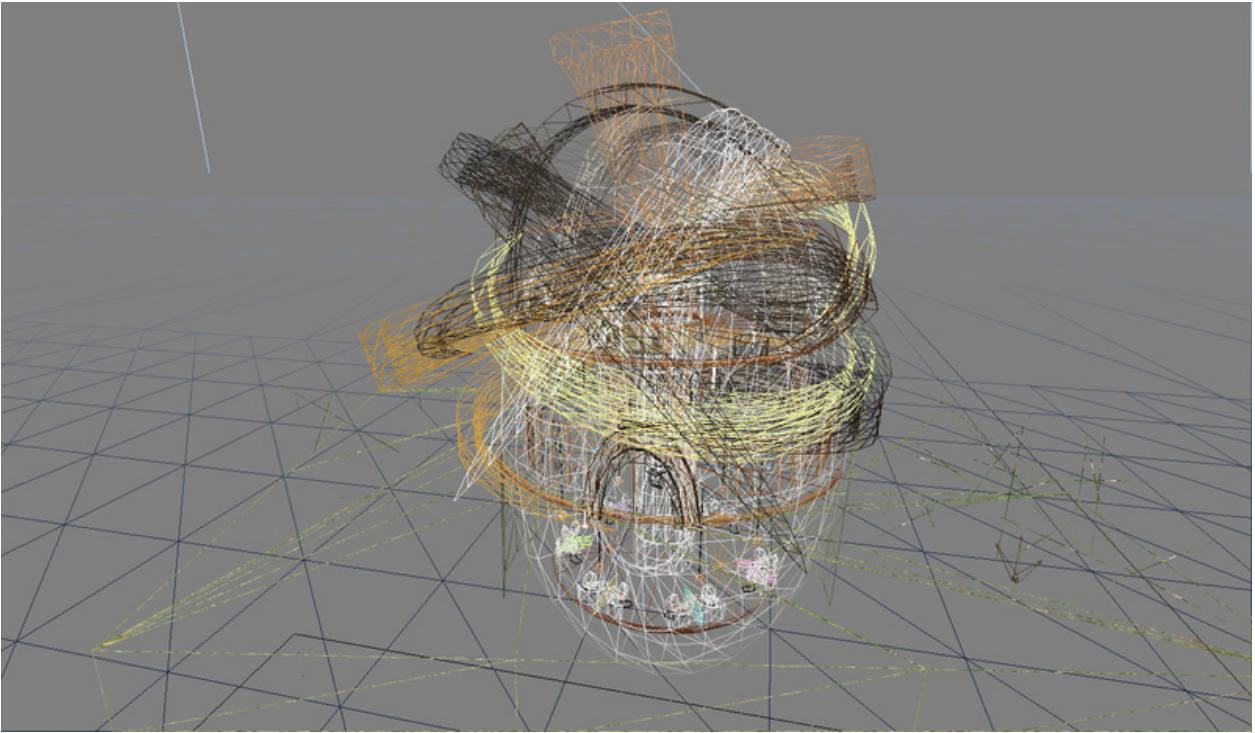
Appendix E: Industry Partnerships

WHO	CONTRIBUTION
MQ	
Andrew Cram	Project research
Professor John Hedberg	Project mentoring and research
Michael Johnson	Project mentoring and research
UNSW	
Professor Richard Goodwin	Student mentoring
Russell Lowe	Student mentoring/research collaboration
Bournemouth University	
Professor Stephen Heppell	Student mentoring
DET	
Peter Wootten	Teacher/Project design, assessment and rubric
Lisa Hoelzl	Teacher/assessment and rubric
Technology Providers	
Panasonic, Lenovo, DEHub	3D Multi-touch IWB Projection, 3D Camera and Glasses
Exhibitions	
Sydney College of the Arts, USyd	WHEN2050 exhibition: 5–29 October, 2011 as part of the 3dedrats Festival 2011.
Conferences	
Stephen Heppell	VC with Dulwich HSVAD: “Playing with Learning Spaces” 17 March, 2011
South Western Region	SWR Inspire Innovate ICT Conference 29-30 March, 2011
Northern Sydney Region	NSR GATS Conference: “Unleashing the Gifted Potential” 19-20 May, 2011
Coventry University, UK	Innovative Research in Virtual Worlds 2011 Conference 3-4 November, 2011

Appendix F: Student work samples

Design Concepts





Research essays

Produce a 1000 word essay that reviews the work of one of the architects listed. Examine the influences upon their style of architecture and their philosophy towards architectural design. Use at least two of their designs to demonstrate their significance to the advancement of architectural design. Produce an analysis that compares your design in 2050 and the work of your selected architect.

Student: Isabella Martin

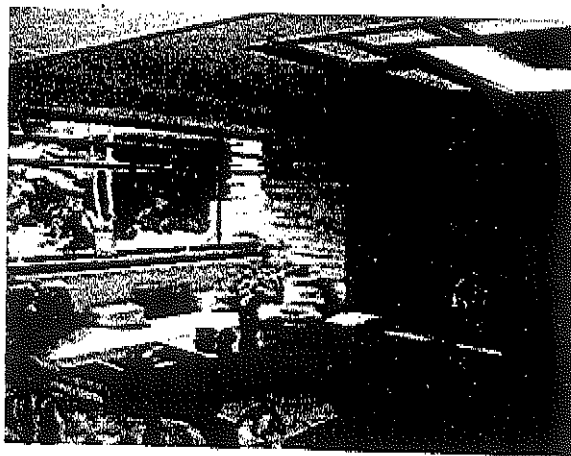
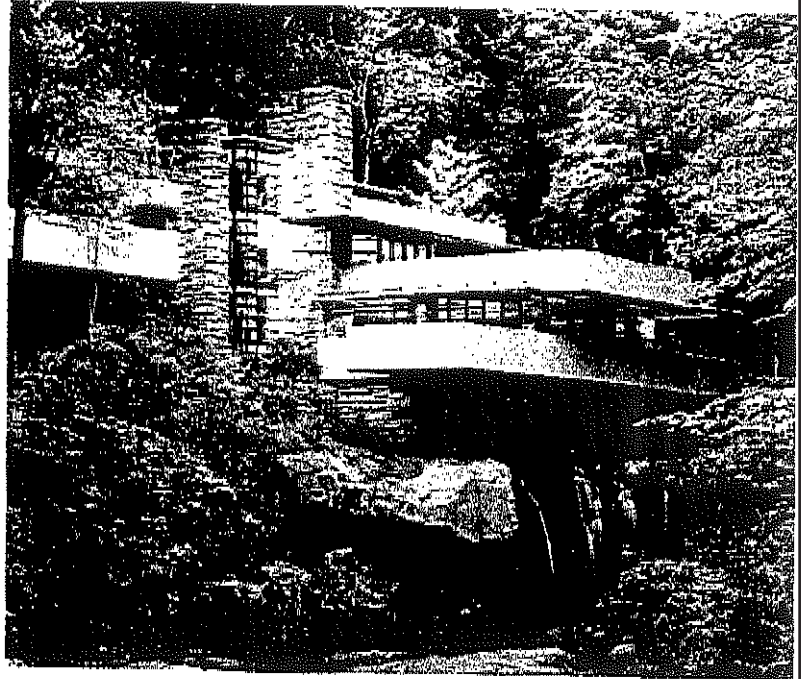
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Frank Lloyd Wright

Frank Lloyd Wright (1867-1959) was a world renowned architect, as well as interior designer, writer and educator – building over 400 structures; he is arguably most recognised for the Guggenheim Museum in New York City. His philosophy centred on organic structures, believing that architecture should involve an interaction with nature. 'Form follows function' became the main inspiration for modern architecture, and Wright saw it as 'Form and function are one'. Wright also believed that buildings should respect the earth on which they stood and become a natural part, or extension of the landscape. He believed that buildings could have a spirit, just like all living things.

Frank Lloyd Wright was working a century ago, yet his architectural designs and philosophies are still seen as modern and groundbreaking today. His fascination with organic structures resulted in creations considering the finest details. Along with designing the physical structures, he laboured over both external and internal fixtures – from carpets, windows, chairs and light fittings – he was one of the first architects to supply his buildings with custom made fittings. This integrated all aspects of the architecture, and often he would go back to his earlier buildings to redesign the interiors. Wright often included glass in his designs as it matched the philosophy of organic architecture; he described glass as 'the mirror of nature' – resembling rivers, ponds and lakes in the reflections they shadow and duplicate.

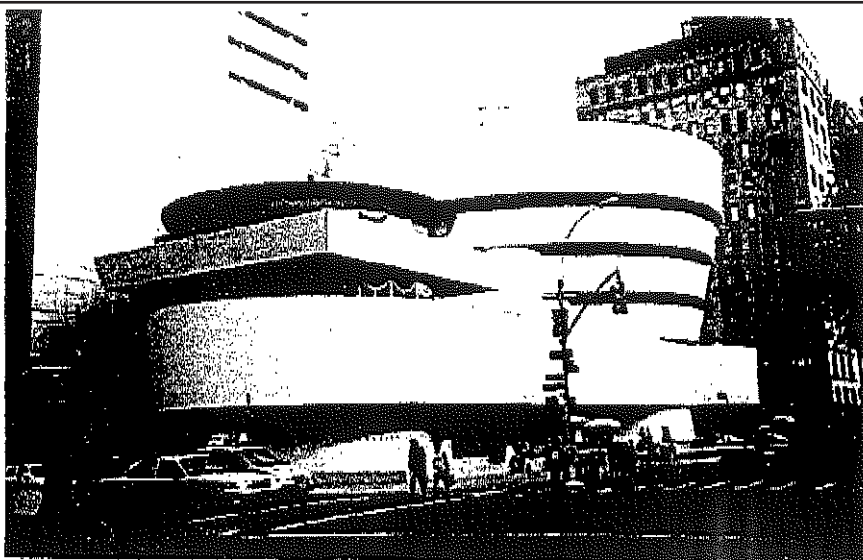
Fallingwater (Mill Run, Pennsylvania 1937) is considered to be one of Wright's finest works. It is the last Wright house with the original setting, furnishings and artworks intact. A 1991 poll of the American Institute of Architects voted the building 'the best all-time work of American architecture'. The house is built from materials found in the natural environment – walls and floors of natural stone from the



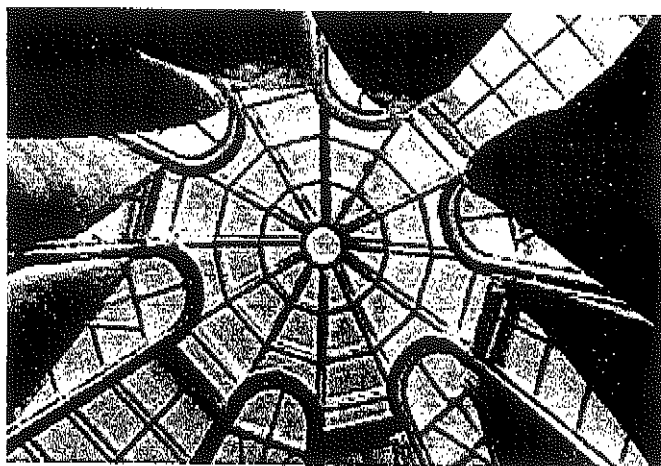
surrounding land. The building and setting combined with Wright's passion for Japanese architecture resulted in a beautiful, nature-inspired home. The multi-levelled house has many of its spaces combining interior and exterior, thus resulting in harmonious interaction between living spaces and nature, inviting the outside in. Fallingwater was the Kaufmann's family weekend home and in 1963 the property was donated to the Western Pennsylvania Conservancy. A year later it was open to the public as a museum. To date, approximately six million people have visited the renowned building.

The world famous Solomon R. Guggenheim Museum (New York City, 1959) is one of the 20th century's most famous architectural landmarks. The building famously spirals to the top, making the interior walls slightly concave. Some argue that this style isn't functional, and paintings rest on the wall on a slight slant – like looking at it on the artist's easel. However this aspect of the design is exactly what makes it famous – the modern, curved walls of the gallery are unconventional and groundbreaking. The interior resembles a seashell, and visitors of the gallery experience the works by taking a lift to the top floor and slowly

descending the spiralling floor. The contrast of the boxy surrounding buildings and the Guggenheim definitely makes the gallery stand out, and in 1992 a taller



rectangular tower was added, raising much controversy. The addition was seen as disloyal



to the original designer, Frank Lloyd Wright. It is widely agreed that the 'most important piece of art in the collection' is The Guggenheim itself. The building is iconic and widely recognised in pop culture – featuring in many films such as *Men in Black*, *When in Rome* and *The International*.

The interaction between living species and the environment was a significant theme that inspired the Virtual World 2050 project. Symbiosis is exactly what inspired the design process – being able to feed off the land; producing renewable energy sources and building structures that managed to maintain the uninterrupted natural environment. *When 2050* is a project that inspires thought on the topic of sustainability – when exactly are we going to prioritise sustainable, conscious architecture? The 'HAB' structure incorporates as much renewable energy generation as possible; to heavily reduce the amounts of toxins and pollutants released from non-renewable energy sources. These renewable energy generation sources include solar panels and wind turbines. The topic of sustainability is a pressing current political and economic issue – changing environmental conditions are demanding living solutions for future generations, and these are complicated by theories, debate and costs.

Our virtual world building complex incorporates sustainable, modern living – with plenty of comfort. The running theme of a sphere in our buildings represents the circle of life and

symbiosis, which is inspired by the intent for a positive future and new beginnings. Much like Frank Lloyd Wright, our design is influenced by nature – the organic forms of plants and living creatures - creating a manmade environment to complement the land; not destroy it. Negative impacts on the environment can be minimised by smart use of materials, energy and space.

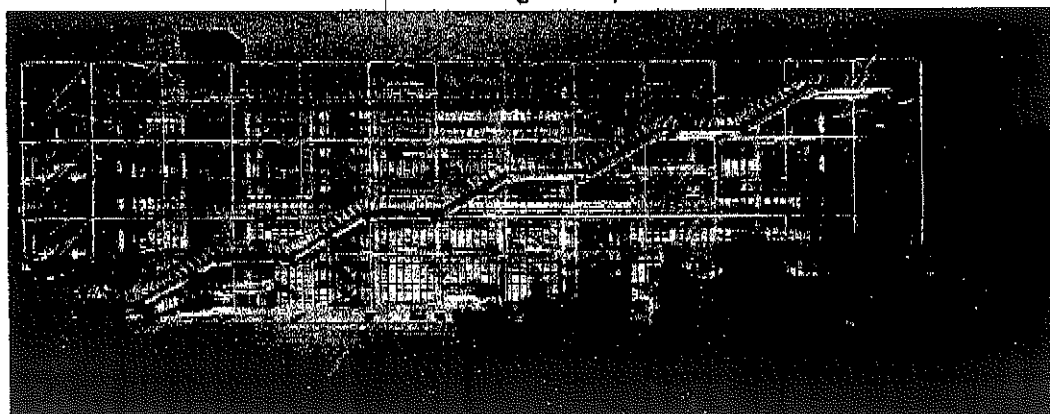
Frank Lloyd Wright is still an active influence on our modern architectural design. His buildings may not be the most recent constructions, but they are continually recognised as cutting-edge in architecture. The idea of a building immersed in nature and sustainability is appealing, with greater urgency now than perhaps ever before, incorporating form and function equally, and carefully considering a buildings' impact and relationship with the earth and environment.. This relates to our Virtual World 2050 project incorporating renewable energy with futuristic design. In an area such as Sydney, a city that is increasing in density, looking towards the future is the key to sustainable living. The virtual world allowed us to experience and experiment with our own ideas, geometric and organic forms, and to consider the lifestyles and requirements of generations to come.

Student: Imogen Rafferty

Renzo Piano

Renzo Piano is a widely recognised, extremely successful, architecturally brilliant man from Italy who designs modern buildings all around the world. Renzo Piano was born in 1937 in Genoa, Italy. His father, his brother, four of his uncles and his grandfather were all building contractors, giving him insight and background into the art of building and structures. But Piano, although he admits it would have been more logical to become a builder, decided to pursue the study of architecture. Renzo Piano studied in Milan at the Polytechnic Architecture School. Whilst studying he regularly visited sites that his relatives were working at, gaining valuable information on structural stability and practical experience. Graduating in 1964, Piano began experimenting with light-weight structures and basic formations. Piano's first significant contract was in 1969 – to design the Italian pavilion at Expo 70 in Osaka. It was there that Renzo Piano came into first contact with British modernist architect, Richard Rogers. From 1965 -1978 Renzo Piano worked with other architects creating one of his first and one of his most famous buildings. He worked with Richard Rogers and later Louis Kahn (a well known American architect). Rogers and Renzo worked together to create Renzo's first building in 1977, the Centre Georges Pompidou in Paris, France.

Centre Georges Pompidou

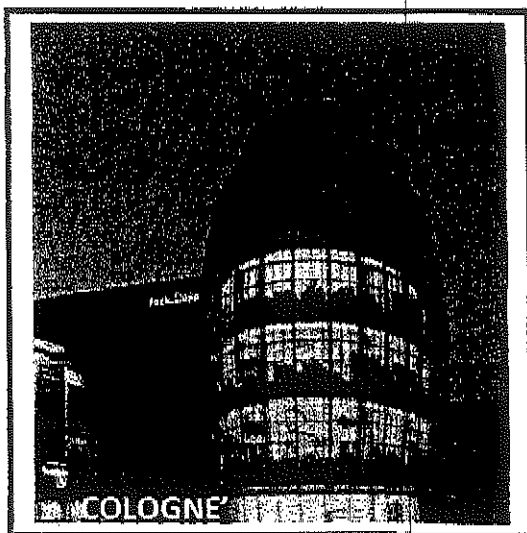


This museum was designed for the heavy flow of people that would enter in and out of the building daily. With support beams, duct work, and other functional elements placed on the exterior of the building, Centre Pompidou in Paris looks as though it has been turned inside out, revealing its inner workings. Centre Pompidou is often referred to as a landmark example of high tech (for its time) architecture.

Renzo Piano designs many of his buildings to embody and pull in natural light. Using large windows and many high glass walls, Piano designs his buildings to absorb the richness of sunlight. Each building he creates follows some of the most dated architectural rules whilst incorporating his style of modern curves and flow, metal and glass, finesse and grace. He has designed 44 buildings all together over the space of 40 years. From homes to apartments, offices to shopping centres, museums, factories, workshops and studios, airline and railway terminals, expositions, theatres and churches, city planning, bridges, ships, boats and cars, Renzo has designed it all.

One of Renzo Piano's buildings that is highly recognisable in the Australian community, for its great adaptation to the environment around and the function it will carry out, is Aurora Place, Sydney. It is a 48 story office and residential tower that overlooks the Botanical Gardens. The building looks as though it has been curved and sliced at an angle, giving it a jagged yet smooth look. It is a contrast within itself and has a distinct and abstract look. This building's structure is comprised of reinforced concrete in the shape of a lozenge. The floor plan of the building, increases in size with the height of the building so the building appears to lean outward. This design aspect has contributed to the futurist, abstract and novel appearance of the building. It is encompassed by layers of glass (these are the curved, jagged parts of the exterior), although they have been heat treated and made to endure the elements, this was not enough and the glass was not stable enough to properly endure the elements. Renzo Piano came up with the inspired idea of using teflon dots to reduce the absorption of heat. The Teflon dots increase the dissipation of heat. The dots are closer together around the edge of the glass to increase the even distribution of heat along the surface. This will stop the glass from snapping.

Renzo Piano's philosophy is one that reflects my *When 2050* work. His philosophy, applying to both the art of architecture and the buildings he designs, is the following: "Architecture is a living thing, evolving with time and practice". His philosophy mirrors his work vividly, all his buildings encompassing light, life, atmosphere and character. His buildings gather reputation as does his career, as each year goes by and more of his inspirational designs come to life, he gains more and more fans and followers. I believe my *When 2050* reflects this philosophy too. My building is in the shape of an egg, eggs can be living things, or that inside them can be, and as time goes on, what is inside the egg transforms and evolves, just like Renzo Piano's philosophy. Our egg building in itself also grew and evolved as time passed and we practised. It went from a simple egg structure to a three level gallery, office, artist space complex. The shape of the building also somewhat reflects the shape of Renzo Piano's building 'Cologne', shown in the image below.



Renzo Piano uses his individual and creative design ideas to create beautifully abstract, compelling complex and extremely fascinating buildings that continue to make the cities of the world more and more attractive every year. His philosophy, "Architecture is a living thing, evolving with time and practice" has influenced not only myself but hundreds, even thousands of architects to create 'living, evolving' buildings that wow the world. Renzo Piano is an architect whose style continues to amaze, and a man who really sets the bench mark for modern, spacious, abstract and beautiful architecture.

Student: Ally Grasso



ZAHA HADID

Zaha Hadid is architect that has and is radically shaping the face of architecture and design forever. Hadid is internationally renowned for her innovative and dynamic designs, which continuously go beyond all boundaries. Hadid is one of today's most groundbreaking and influential architects, taking revolutionary experimentation in urbanism, architecture and design to the next level. Hadid has astounded the world with her designs and proved that virtually anything in design is possible. She goes against all popular trends and leaves a mark on modern architecture as the new and coming age of endless design.

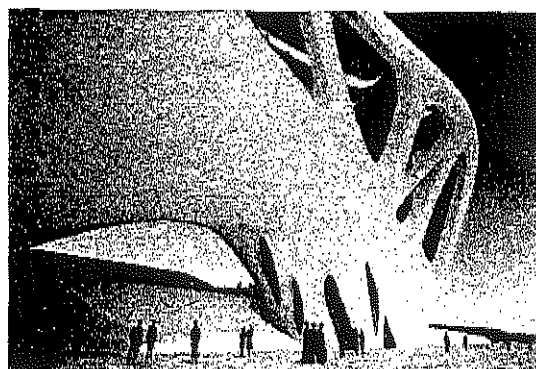
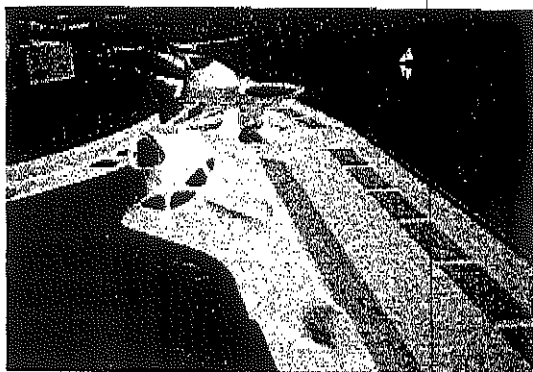
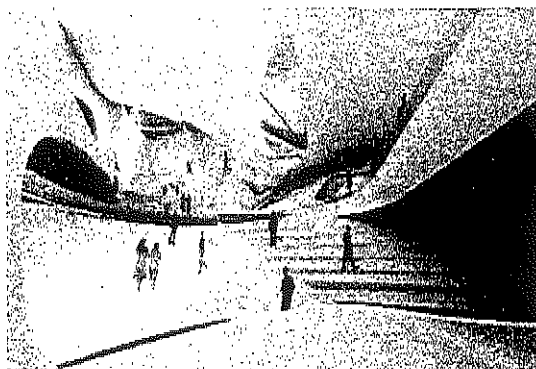
Zaha Hadid was born in Baghdad, Iraq in 1950. She studied at the University of American Beirut completing three degrees in mathematics, she then studied at the Architectural Association School in London. This was just the beginning of Hadid's future in architecture. The AA (Architecture Association) was the perfect place for ambitious future architects to be born. The AA was home to many renowned household names such as Rem Koolhaas, Daniel Libeskind and Bernard Tschumi.

Rem Koolhaas was one of Hadid's favourite tutors, who later offered her a job as a partner in his new firm, the Office for Metropolitan Architecture. Hadid didn't last long at the firm as her ideas were far too different and somewhat much ahead of Koolhaas'. Koolhaas described her as "a planet in her own orbit". But Koolhaas did have a great influence upon Hadid's style of architecture. Koolhaas taught Hadid the basic principles of architecture leading her into creating her own style of very modern curved and fluid designs. This led Hadid on to establish her own London based practice in 1980. During this time she also taught at the Architectural Association.

Many call Hadid's work baroque modernism, this is the idea that a single viewpoint can be used to lift the eyes from very dizzy spaces to the 'heart of god'. Her work experiments with new concepts that exaggerate urban landscape, in theory this is to create designs that are aesthetically appealing and incorporate all areas of design from urban landscape to interior. Hadid has thrown out the old ways of design from walls, ceilings, front, back and asymmetry and now creates designs that are 'fluid'. Creating buildings that have multiple perspectives, fragmented geometry and virtually morph into what no longer looks like a building but mirrors the chaotic fluidity of modern life. Her designs use natural fluid, curves and exciting explosive spaces. She uses natural land and integrates her design into them to build the design. This is one of Hadid's main philosophy's, to build structures that are somewhat coherent with natural landscapes, thus taking the old and modifying it. Her other main philosophy is to create buildings with endless flow to seem like they are about to take off from the ground.

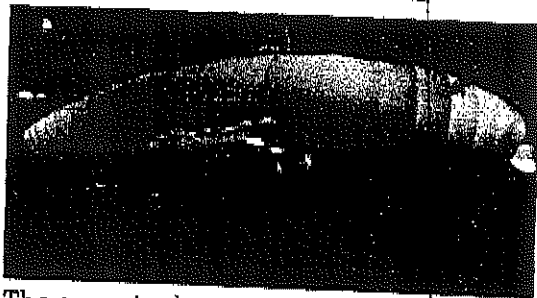
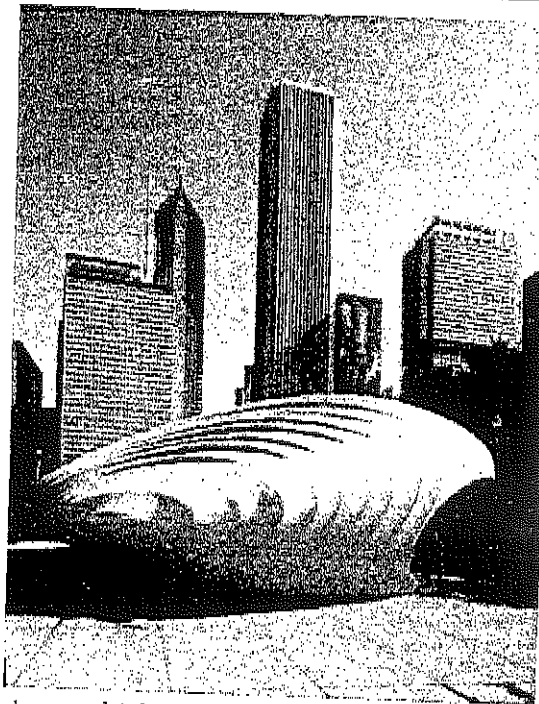
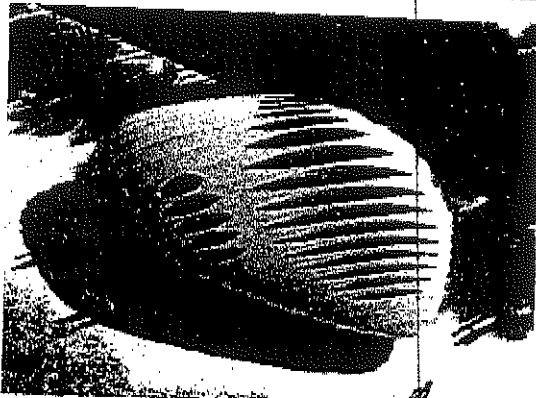
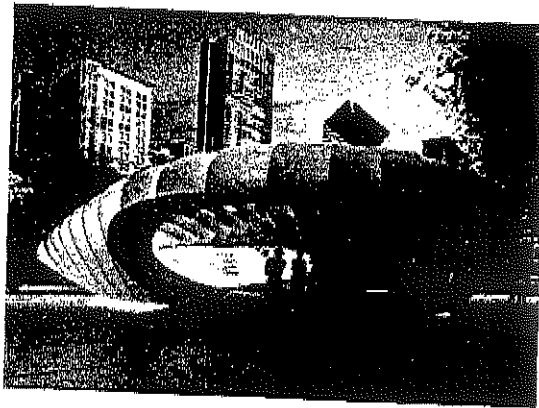
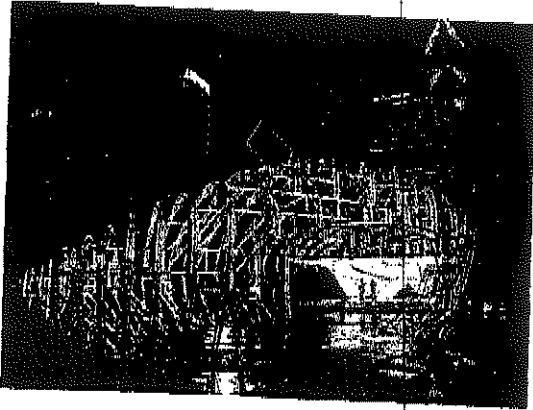
For example Zaha Hadid's winning entry for the new Nuragic and Contemporary

Art Museum in Cagliari Italy. The building will be over 12,000 square metres. It will be filled with exhibit halls, a library, meeting spaces, offices and retail areas. The new cultural centre will serve as entrance to the city of Cagliari for those arriving by sea. The aim of the project is to create a place of cultural exchanges that can also serve the purpose as a landmark. The building is very much about the relationship between the people, art and the city. The connection with the public paths, open spaces and cavities make the building share its public dimension with the city. The organic shape of the building follows the lines of the adjacent shoreline.



The open and dynamic shape of the inside allows circulation between the visitors through the exhibition, information and commercial areas. The cavities inside the building allow open spaces for exhibition, places of aggregation and occasions for installation of contemporary art. Hadids design is like a coral reef, empty inside, hard and porous on the external surface, able to accommodate, hold activities in a lively and changing environment.

Another great example of Hadid's extraordinary designs is her design for the temporary pavilion in Millennium Park, Chicago. This design is said to look very much like a futuristic tent, again following her theme and philosophy of endless flow. The building will be built with an inner skeleton of aluminum rods and then covered in a silver fabric. This sleek design will transform the urban landscape into an ultra modern centre revolved around the people of Chicago.



The organic shape of the structure is very unique, which somewhat looks like a pod. The design has been well thought out as it has gashes to let in light and pod-like openings that people can pass through. It is just another great example of Hadid's fantastic form of architecture.

Zaha Hadid's architecture design have many similarities to my 'When 2050 Symbiotic City' design. The main principles that Zaha Hadid's designs live by are making spaces that bring communities together. She does this by creating a structure that in shape force people to move through the building like a gallery

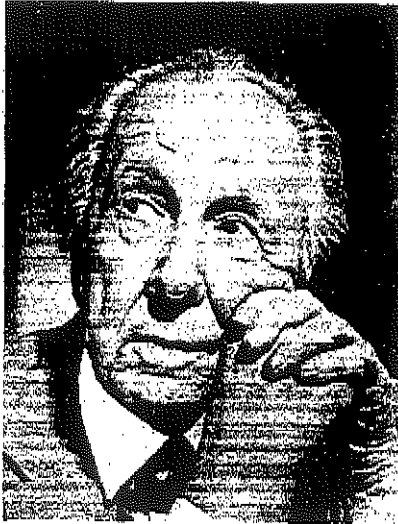
and bring people together. My When 2050 design was based around the idea of community and bringing people together and therefore is very much like the concept of Hadid's structures. Zaha Hadid makes her space for people to feel good in and excited as did my design. Not only is a building for shelter but for recreational purposes. Bringing people together to enjoy a space making it one big community.

"Architecture is really about well-being. I think that people want to feel good in a space... On the one hand it's about shelter, but it's also about pleasure. The intention is to really carve out of a city civic spaces and the more it is accessible to a much larger mass in public and it's about people enjoying that space. That makes life that much better." - Zaha Hadid.

To conclude Zaha Hadid, is an architect living in the future. Her designs are ones that are transcending the true meaning of architecture design. She never fails to keep us on our feet, continuously thinking head of time. Zaha Hadid has and always will have a catastrophic influence on today's age of architecture.

Student: Tango Conway

Frank Lloyd Wright



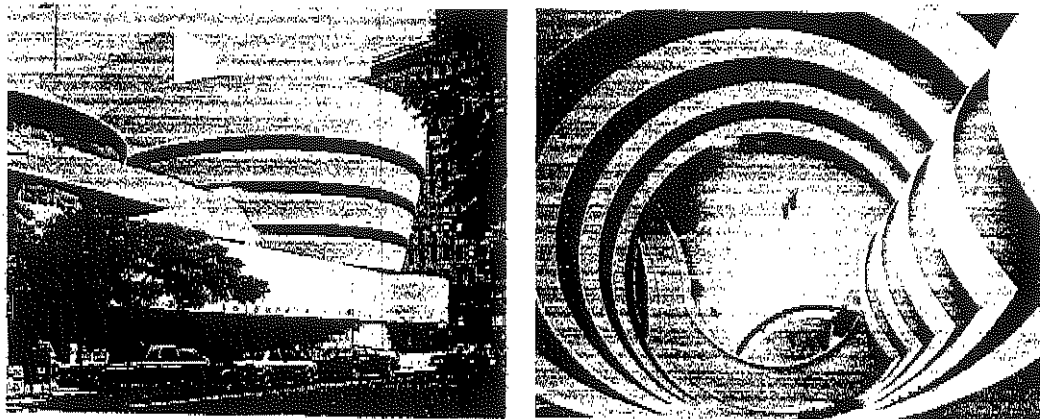
The revolutionary architect, Frank Lloyd Wright, was born on June the 8th 1867. His unique ideas and concepts are what helped him create such architectural wonders such as the Guggenheim Museum, the Marin Country Civic Center and Fallingwater. Wright was one of the most influential fathers of 20th century architecture and led the forefront of innovative design for just short of 70 years.

After spending his summer on his uncle's farm, where he formed his passion for nature and realised his dream to become an architect, Frank moved to Chicago In 1887 to work for Joseph Lyman Silsbee and then worked in a firm of Adler and Sullivan. While working directly under Louis Sullivan, Wright derived his own philosophy from Sullivans "Form Follows Function" theory, his theory was "Form and Function are One". This theory aimed to discard the classic European Renaissance styles and base architecture on America's democratic values and human dignity. Wright celebrated the natural beauty of materials and how they grew with their surroundings. In many of Wright's works, you can see the influence of a natural flow and cycle throughout his buildings, how they are at one with the environment around them and that the "Form and Function are One".

One of Wright's most famous designs, is the Guggenheim Museum of New York it is a building of sculptural pureness. The building is a continual spiral with a UN obstructed centre covered by a glass dome roof. Wright explained the use of using a continuous ramp instead of levelled floors and how it serves more

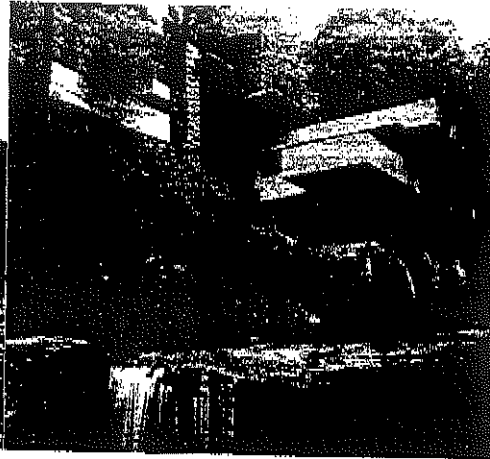
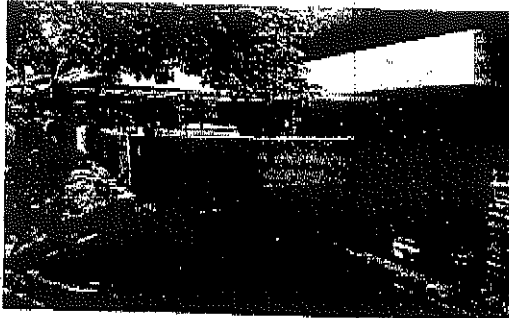
convenient, "You enter the building, take the elevator to the top ramp, gradually descend around an open court, always have the option, as the ramp touched the elevator stack at each level, to either go back, or skip down to further levels, and finally, at the end of the exhibition, he would find himself on the ground floor, near the exit."

This building is quite similar to my egg shaped building in that the function is for people to flow through the building with ease. The Guggenheim directs the flow with a continuous spiral to the ground floor; my design has curved walls that move people through the gallery in a natural manner. In both designs the natural flow of the building has the same purpose to showcase the art exhibited in the gallery.



Frank Lloyd Wright's Guggenheim Museum in New York (above)

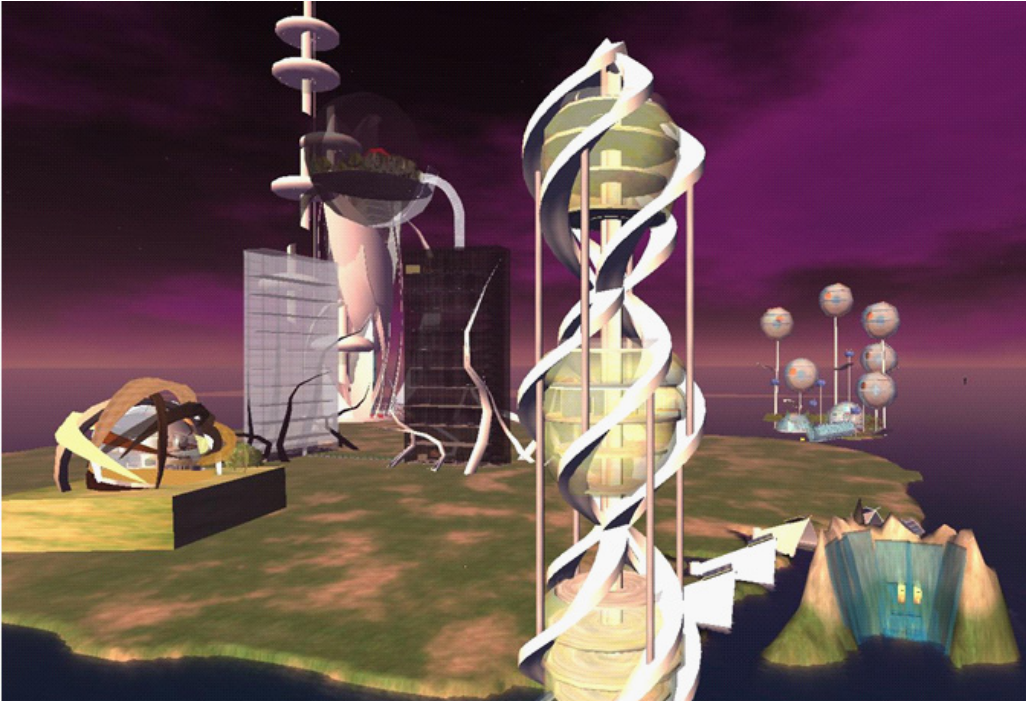
Frank Lloyd Wright is also notorious within the world of architecture for his Fallingwaters building. It's a private residence that was finished in 1937; it aimed to connect the residents living in the building to the nature outside of the building in a mature, organic style. The building features a waterfall that runs underneath the building and cantilevered balconies that overhang the cliff-face. The verticals of the building are natural limestone and the horizontals are reinforced concrete. Every aspect of this building is natural and organic and it unites industrial urban living with a wholesome and pure design.



Frank Lloyd Wright's Fallingwater residential building (above)

Wright's work not only looks incredible but its functions are practical and are "at one" with the aesthetics. He set a high benchmark for every architect since the early 20th century and his designs still remain aesthetically modern and current. My 2050 design is similar to his work ethic and the concepts of my work relate to Wright's "Form and Function are one" philosophy. Frank Lloyd Wright is by no doubt one of the fathers of modern architecture and will remain so as his designs and concepts are at the forefront of evolving architectural styles.

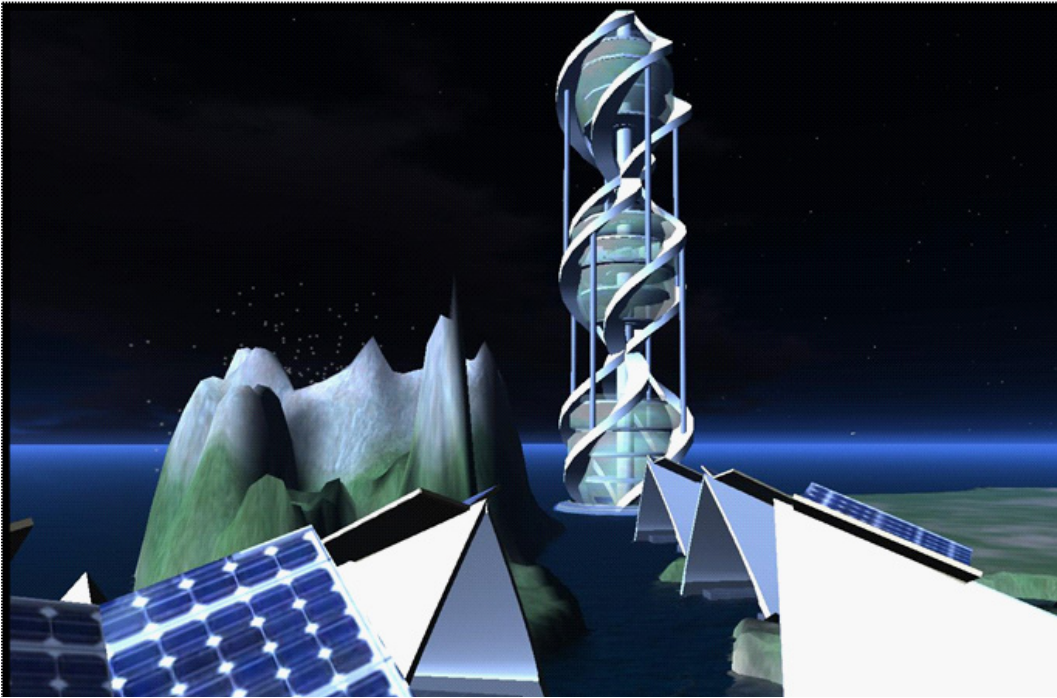
Final in-world 3D designs



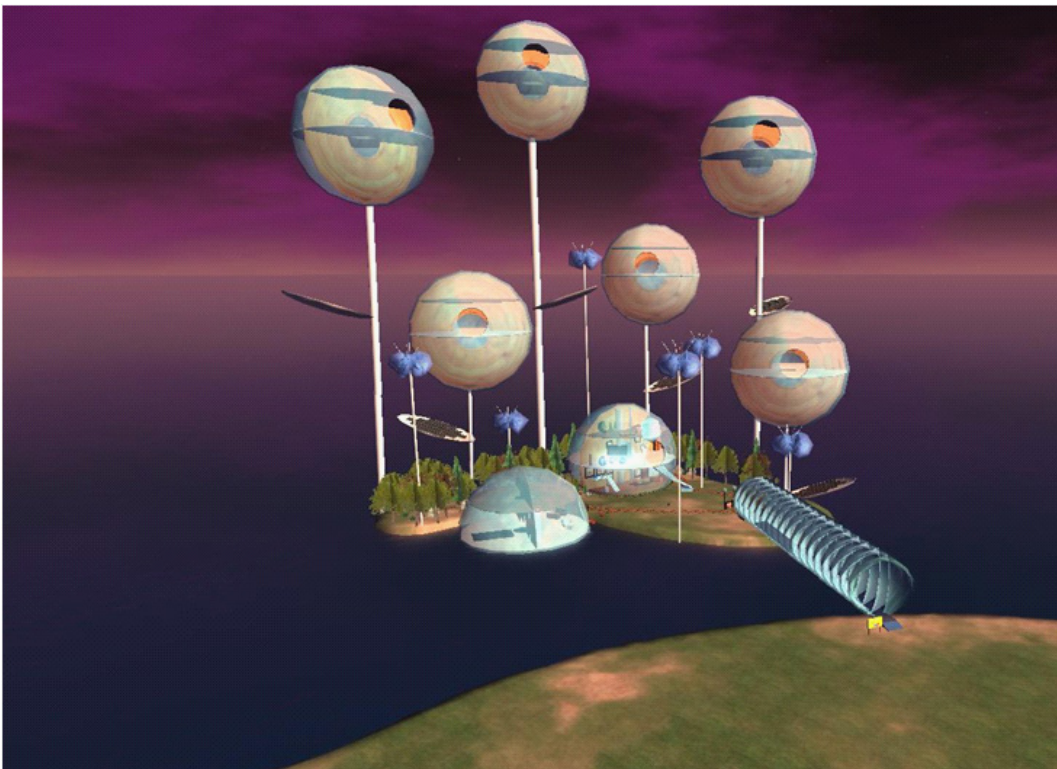
WHEN2050 Architecture for the Future



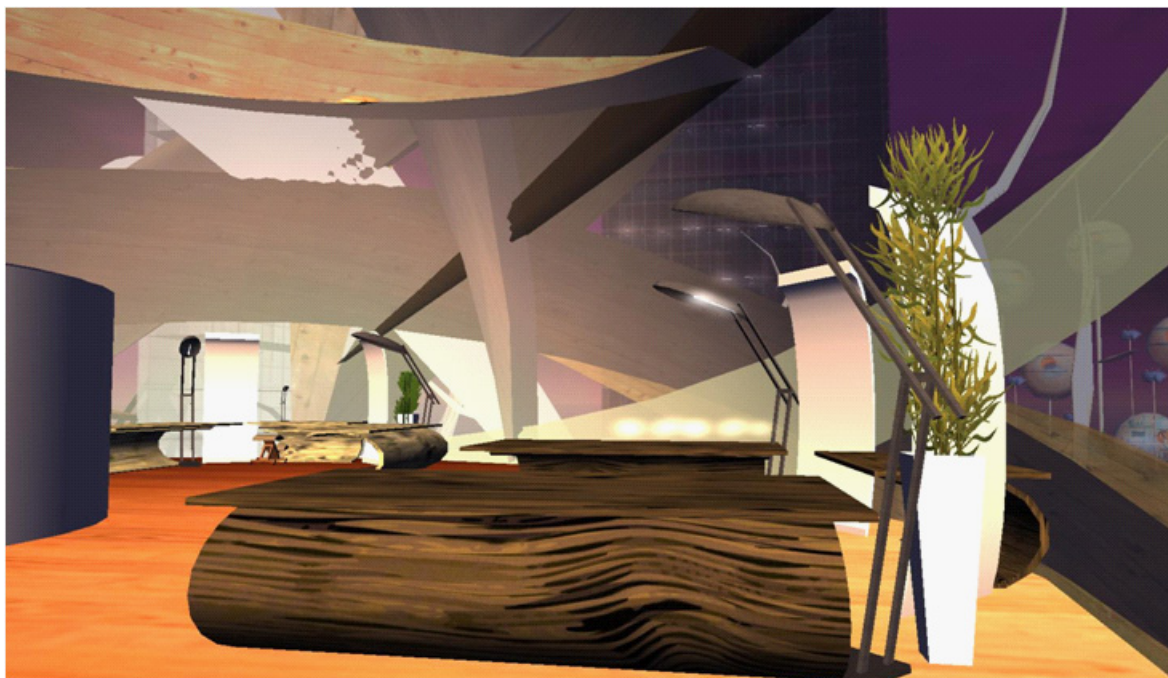
"A Tale of Two Cities": Jason and Paolo



“ Saturation City”: Sebastian and Sharne



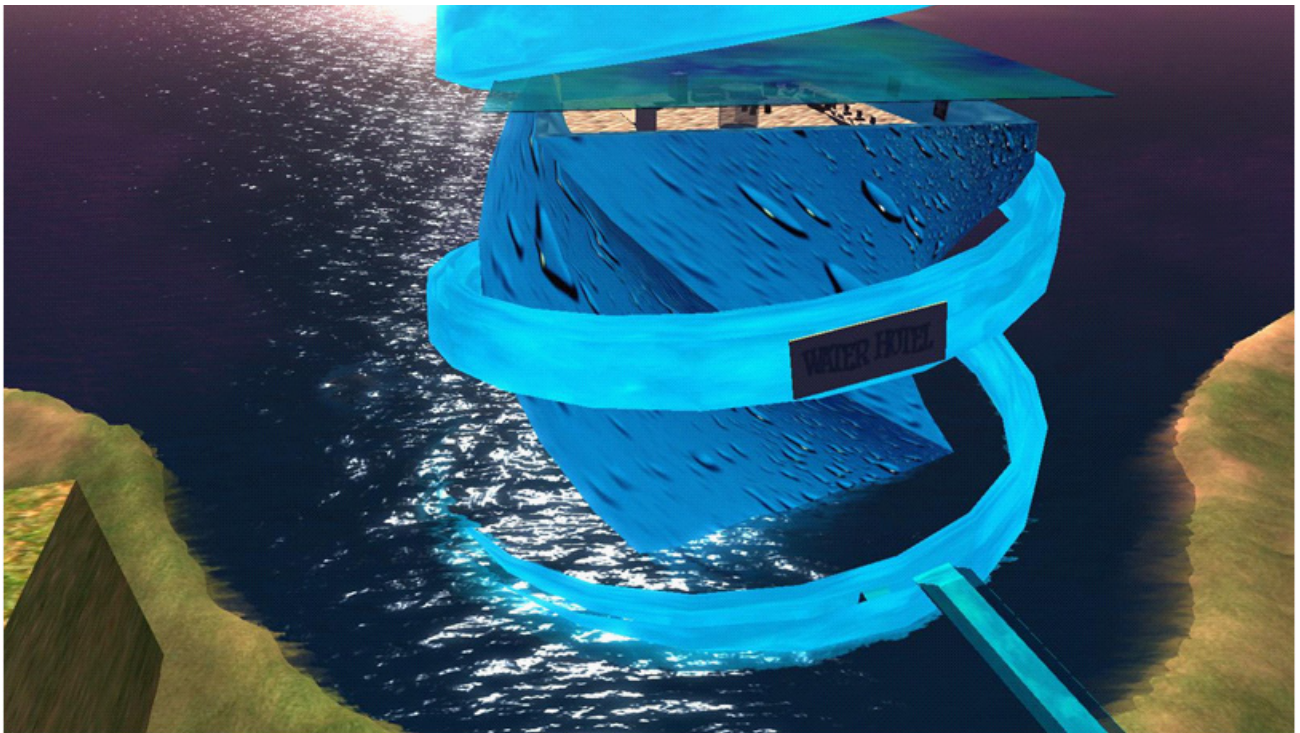
“The HAB”: Hilary, Ally and Bella



“Sunny-Side Gallery, Artist Studio – City of Hope”: Imogen and Tango



“Sunny-Side Gallery, Artist Gallery – City of Hope”: Imogen and Tango



“Oceanic City”: Claire and Jasmine



Iteration 3.1:WHEN2050 “Trinity” 2011

Appendix G: Project Resources

Assessment



Education &
Communities

[WH3N2050]

ARCHITECTURE FOR THE FUTURE

This project has several inherent advantages applicable to extending students as delineated in NSW DET pedagogy/Quality Teaching & Learning.

Students are working from a brief that requires investigation of the Australian Institute of Architects Now + When exhibition at the 2010 Venice Biennale. What type of cities will we have in 2050? The fact that no one knows allows architects to explore a wide variety of themes. DHSVAD students must first explore the themes used in the Now +When project and select one to base their project on. The task requires them to explore the theme through brainstorming and research. The selection of a particular theme dictates the “world” their building will inhabit and the “look” of the final design.

The students will not only base their designs on contemporary practice and futuristic musings, but have an appreciation of the foundations to building and architecture through the exploration of architectural forms in history – post & lintel, columns, arches, domes. Key architects and styles will also be surveyed and the philosophy behind them introduced.

To take the learning experience to a more rigorous level, students will engage in workshops with a prominent Australian architect/artist involved in the AIA NOW+WHEN 2050 project, Richard Goodwin. He will guide the students through the design process and incorporate their appreciation of architecture, foundation knowledge and creative solution making into an approach that will establish a clear evolutionary path for their final design. Students will need to deliver a concept that delivers on all aspects of the design brief.

Richard Goodwin will challenge the class on the architectural dictum ; FORM FOLLOWS FUNCTION and then test the applicability to their own design ideas.

Sustainability in architecture is a core concern of the industry. To add an additional layer of difficulty to the problem solving involved in the task, students will be required to research the issues around sustainability and explore ways to incorporate these functions in their building design while retaining strong aesthetic values.

Good, effective communication is paramount not only for the success of a project but also for making it a positive experience. This project reinforces the need for reflection on practice, self and peer evaluation. Ideas can be shared not only in a spoken form but also in a written form.

Students working in teams of two will communicate to each other and teachers through the chat facility in Trinity, but also through the class Edmodo site where students will record their thoughts and exchange images.

A journal of each student's journey will document the learning process. An additional dimension to real world and virtual world communication is cyber communication where our students will engage with students from year 10 Millenium High in New York.

OpenSim/Trinity are digital tools for realising concepts. The sophistication of those concepts can be limited by inadequate skills. As this is our second opportunity in the virtual world it provides a rich opportunity to challenge students to use the liberating energy of technology that delivers a limitless array of options for the imaginative mind to explore.

Students completing this project will have been immersed in a new way of learning, not only in the digital skills it provides but being able to visualize in a 3-D format.

Given the growing prominence of 3-D forms in communication, students have a distinct advantage in utilising such concepts.

A function of an artwork is to engage an audience. Innovative concepts and images readily attract an audience, measured by its ability to communicate and ignite responses. To this end the WHEN2050 project will reach out to a global audience via the internet as well as draw a real world audience by being exhibited in a major art/design space utilising the latest in 3-D projection.

The learning process for these students is rich and varied culminating in visual imagery that seeks to address perceived issues of the future. This project challenges students to combine the imagination and informed knowledge to deliver creative solutions. The technology as the tool allows for the realisation of these solutions.

ASSESSMENT

Design a building for Sydney circa 2050.

While the design of this building is open to the imagination, there are conditions that must be addressed.

1. The design must be based upon a concept used in the Australian Institute of Architects "Now+When" 2050 project for the 2010 Venice Biennale.

Select one of the following:

- Sydney 2050: Fraying Ground. RAG URBANISM: Richard Goodwin (Richard Goodwin Art/Architecture), Andrew Benjamin, Gerard Reinmuth (TERROIR)
- Symbiotic City. Steve Whitford + James Brearley: Steve Whitford (University of Melbourne, Faculty of Architecture, Building and Planning) + James Brearley (BAU Brearley Architects and Urbanists, Adjunct Professor RMIT)
- The Fear Free City. Justyna Karakiewicz, Tom Kvan and Steve Hatzellis
- A City of Hope. EDMOND & CORRIGAN: Design – Peter Corrigan (everything), Realisation – Michael Spooner (and support)
- Mould City. Colony Collective: Madeleine Beech, Jono Brener, Nicola Dovey, Peter Raisbeck and Simon Wollan
- Sedimentary City. Brit Andersen and Mara Francis

- Aquatown. NH Architecture with Andrew Mackenzie
- Multiplicity. John Wardle Architects & Stefano Boscutti
- Ocean City. Arup Biomimetics: Alanna Howe, Alexander Hespe
- -41+41. Peck Dunin Simpson Architects: Fiona Dunin, Alex Peck, Andrew Simpson in association with Martina Johnson, Third Skin, Eckersley Garden Architecture, Angus McIntyre, Tim Kreger
- Survival vs Resilience. BKK Architects, Village Well, Strategic Property Analysis, Mathematical Modelling
- Terra Form Australis. HASSELL, Holopoint & The Environment Institute: Tim Horton, Tony Grist, Prof Mike Young, Ben Kilsby, Sharon Mackay, Susie Nicolai, Mike Mouritz
- Island Proposition 2100 (IP2100). Scott Lloyd, Aaron Roberts (room11) and Katrina Stoll, + Swiss Federal Institute of Technology Zurich (ETH)
- Implementing the Rhetoric. Harrison and White with Nano Langenheim: Marcus White, Stuart Harrison and Nano Langenheim
- How Does It Make You Feel (HDIMYF). Ben Statkus (Statkus Architecture), Daniel Agdag, Melanie Etchell, William Golding, Anna Nguyen, Joel Ng
- Loop-Pool/Saturation City. McGauran Giannini Soon (MGS), Bild + Dyskors, Material Thinking: MGS – Eli Giannini, Jocelyn Chiew, Catherine Ranger, Bild – Ben Milbourne, Dyskors – Edmund Carter, Material Thinking – Paul Carter
- A tale of two cities. Billard Leece Partnership Pty Ltd

2. Issues regarding Sustainability must be incorporated into the final design

- Heating, Ventilation and Cooling System Efficiency
- Renewable energy generation
- Solar Water Heating
- Heat Pumps
- Sustainable building materials
- Recycled Materials
- Lower Volatile Organic Compounds
- Waste management
- Water management
- Building placement
- Social sustainability in architecture

3. DESIGN - Aesthetics/Form Follows Function

Aesthetics is a branch of philosophy dealing with the nature of beauty, art, and taste, and with the creation and appreciation of beauty. It is more scientifically defined as the study of sensory or sensori-emotional values, sometimes called judgments of sentiment and taste. More broadly, scholars in the field define aesthetics as “critical reflection on art, culture and nature.”

Form follows function is a principle associated with modern architecture and industrial design in the 20th century. The principle is that the shape of a building or object should be primarily based upon its intended function or purpose.

4. Digital Technology Skills

The success, complexity and ease with which the design is produced in the virtual world of Trinity will be significantly determined by developing skills and confidence in using the OpenSim software to realize design concepts.

Experimentation, concentration on exploring concepts and building procedures and familiarization of the software is critical for delivering a high quality design solution.

5. Research

There will be a requirement to investigate:

- Different methods of building construction Post & Lintel, Columns, Arches, Domes, Flying Buttresses
- Key periods and styles in architectural history Gothic, Renaissance, Chicago School, Bauhaus International style, Post-Modern Le Corbusier, Buckminster Fuller, Frank Lloyd Wright, Mies Van Der Rohe
- Contemporary Practice

Richard Goodwin

AIA NOW+WHEN exhibition

Futuristic architecture

Bank of America Bldg NYC

David Fisher's Dynamic Tower/Dubai

6. Site Location

Students will need to scout the city of Sydney for a suitable location in which to place their building. Photographs are to be taken of the surroundings that are to be transferred into the virtual world. The building is to be built within that site to give it an historical context.

Students should also use Google Earth/Maps to assist in this task.

7. Documentation

Communication in this project is important as students will work in teams. The exchange of ideas, techniques will occur through the chat function in Trinity as well in one-on-one discussion.

Communication will be extended through class, teacher, project personnel from MACICT and students from Millenium High School, New York City. This will occur through Edmodo (an education specific site for cyber communication).

Edmodo serves as a forum for the exchange of ideas as well as reporting by each student of their goals and achievements, set backs and documents the journey that they take in the project from beginning to conclusion.

8. Exhibition

WH3N2050 as a project involves very significant input of resources and personnel from MACICT, the NSW Department of Education, Macquarie University and the students and staff from Dulwich High School of Visual Arts and Design.

As a university research project it explores the application of the latest technology in assisting students in advancing their learning outcomes, extending students in ways of comprehending and solution making that currently do not exist in the classroom anywhere in the world.

To this extent, the project has attracted international attention with overseas academics and international and Australian conferences focusing on technology and education issues.

The student work produced in WH3N2050 will be recorded using Panasonic 3-D technology and be projected in exhibition in 3-D. A number of visual arts and technology exhibition spaces are currently in negotiation to showcase the project. The project will also be shown in upcoming conferences and be available to view on the Internet.

The project is divided into sections each of which is being assessed.

ARTMAKING/VIRTUAL WORLD

You are to work individually and also as a team member to design a building that is based on a theme used in the AIA Now+When exhibition at the Venice Biennale.

This building will be constructed in a virtual world – Trinity using OpenSim

The design must incorporate functions that embrace sustainability in architecture

The building is to be established in Sydney circa 2050

Documentation will be through screenshots, a video and a copy saved to a hard drive and show exterior views of the building as well as an interior view of at least one room.

Students are to be aware of and practice appropriate cyber-citizenship within the virtual world

RESEARCH

A 1000 word report that documents;

How historical and/or contemporary architectural design informs your design choices – concepts, materials, issues (refer to examples and include images).

Why you have selected a particular theme from the “AIA Now+When exhibition” to base your design on and what you want your design to say in relation to Sydney 2050.

What is Sustainability in architecture and how will you incorporate it into your design?

What role does Form Follows Function play in architecture?

What have you learnt from the Richard Goodwin’s workshops/artist’s practice?

How have his ideas influenced your design process?

EDMODO JOURNAL/DOCUMENTATION

The journal records your journey (artist’s practice) from beginning to end in the Project.

You are required to make entries in Edmodo each day you work on the Project, whether that is in virtual world or the classroom.

The journal should reflect your intentions for your design, what you have learnt, what worked, what did not work. What or why have you taken a different approach to developing your design or construction method in Trinity.

The journal not only serves to document your journey, but is also a means of communicating with others. Your Edmodo entries should show communication with your team member, other classmates, teachers as well as students from New York.

Correct writing practices should be applied.

Students are to be aware of and practise appropriate cyber-citizenship in their writing.

GRADE	WH3N2050/trinity TASK 1. ARTMAKING: VIRTUAL MODELS - ARCHITECTURE Marking Guidelines	score
<p>A</p> <p>OUTSTANDING ACHIEVEMENT</p> <p>18-20</p>	<ul style="list-style-type: none"> • FRAMES (5.3) The student has comprehensively researched and incorporated innovative problem solving solutions in sustainability design and aesthetic considerations • REPRESENTATION (5.4) the student has extensively explored architectural design as a source for ideas and inspiration based upon the selected theme • CONCEPTUAL STRENGTH (5.5) The student has made informed choices through extensive investigations into architecture & design. Concept (Theme) has been developed in innovative ways to provide layers of meaning and interpretation. • RESOLUTION (5.6) The architectural design is creatively resolved in students' technically proficient use of conceptually relevant materials and space. The model is complete when presented for assessment. The virtual technology used to create the model has been used consistently, correctly and expertly. 	
<p>B</p> <p>HIGH ACHIEVEMENT</p> <p>15-17</p>	<ul style="list-style-type: none"> • FRAMES (5.3) The student has extensively researched and incorporated innovative problem solving solutions in sustainability design and aesthetic considerations • REPRESENTATION (5.4) the student has widely explored architectural design as a source for ideas and inspiration with relation to the selected theme • CONCEPTUAL STRENGTH (5.5) The student has made some informed choices through wide investigations into architecture & design. Concept (Theme) has been developed in creative ways to provide layers of meaning and interpretation. • RESOLUTION (5.6) The architectural design is highly resolved in students' technically proficient use of conceptually relevant materials and space. The model is complete when presented for assessment. The virtual technology used to create the model has been used consistently and correctly, indicating a high level of proficiency. 	
<p>C</p> <p>SOUND ACHIEVEMENT</p> <p>11-14</p>	<ul style="list-style-type: none"> • FRAMES (5.3) The student has researched and incorporated predictable problem solving solutions in sustainability design and aesthetic considerations • REPRESENTATION (5.4) the student has explored architectural design as a source for ideas and inspiration with relation to the selected theme • CONCEPTUAL STRENGTH (5.5) The student has made choices through some investigations into architecture & design. Concept (Theme) has been developed to provide meaning and interpretation. • RESOLUTION (5.6) The architectural design is resolved in students' use of conceptually relevant materials and space. The model was significantly complete when presented for assessment. The virtual technology used to create the model has been used with some proficiency to produce satisfactory results. 	
<p>D</p> <p>BASIC ACHIEVEMENT</p> <p>6-10</p>	<ul style="list-style-type: none"> • FRAMES (5.3) The student has minimally researched and incorporated basic problem solving solutions in sustainability design and aesthetic considerations • REPRESENTATION (5.4) the student has made some attempt to explore architectural design as a source for ideas with relation to the selected theme • CONCEPTUAL STRENGTH (5.5) The student indicates some awareness of architecture & design concepts. Concept (Theme) has been limited meaning and interpretation. • RESOLUTION (5.6) The architectural design is simplically resolved in students' limited use of conceptually relevant materials and space. The model is almost complete when presented for assessment. The virtual technology used to create the model is restricted its application. 	
<p>E</p> <p>LIMITED ACHIEVEMENT</p> <p>0-5</p>	<ul style="list-style-type: none"> • FRAMES (5.3) The student has not researched or applied problem solving solutions in sustainability design and aesthetic considerations • REPRESENTATION (5.4) the student has not explored architectural design as a source for ideas and inspiration with relation to the selected theme • CONCEPTUAL STRENGTH (5.5) The student has not made informed choices through investigations into architecture & design. Concept (Theme) has no layers of meaning and interpretation. • RESOLUTION (5.6) The architectural design is not resolved in students' technical use of conceptually relevant materials and space. The model is incomplete when presented for assessment. The virtual technology used to create the model is limited in application. 	1

GRADE	WH3N2050/trinity TASK 2. RESEARCH- HISTORICAL/CRITICAL STUDIES Marking Guidelines	score
A OUTSTANDING ACHIEVEMENT 18-20	<ul style="list-style-type: none"> • FRAMES (5.9) The student has comprehensively researched historical and contemporary sources in construction and architectural design to provide a variety of ways of interpreting architecture • CONCEPTUAL FRAMEWORK (5.8) The student has made extensive investigations into architecture & design to reinforce their theme, sustainability and concept application to Sydney in 2050 • REPRESENTATION(5.10) The student through research, demonstrates a profound awareness of architectural history as a source of ideas and interpretation 	
B HIGH ACHIEVEMENT 15-17	<ul style="list-style-type: none"> • FRAMES (5.9) The student has strongly researched historical and contemporary sources in construction and architectural design to provide a variety of ways of interpreting architecture • CONCEPTUAL FRAMEWORK (5.8) The student has made significant investigations into architecture & design to reinforce their theme, sustainability and concept application to Sydney in 2050. • REPRESENTATION(5.10) The student through research, demonstrates a strong awareness of architectural history as a source of ideas and interpretation. 	
C SOUND ACHIEVEMENT 11-14	<ul style="list-style-type: none"> • FRAMES (5.9) The student has researched historical and contemporary sources in construction and architectural design with limited success to provide some appreciation of architecture • CONCEPTUAL FRAMEWORK (5.8) The student has made investigations into architecture & design to reinforce their theme, sustainability and concept application to Sydney in 2050. • REPRESENTATION(5.10) The student through limited research, demonstrates some awareness of architectural history as a source of ideas and interpretation. 	
D BASIC ACHIEVEMENT 6-10	<ul style="list-style-type: none"> • FRAMES (5.9) The student has made some attempt to research historical and contemporary sources in construction and architectural design • CONCEPTUAL FRAMEWORK (5.8)) The student has made some attempt to investigate architecture & design to link with their theme, sustainability and concept application to Sydney in 2050. • REPRESENTATION(5.10) The student demonstrates some awareness of architectural history as a source of ideas and interpretation. 	
E LIMITED ACHIEVEMENT 0-5	<ul style="list-style-type: none"> • FRAMES (5.9) The student has not researched historical and contemporary sources in construction and architectural design to provide a variety of design solutions. • CONCEPTUAL FRAMEWORK (5.8) The student has not investigated architecture & design to reinforce their theme, sustainability and concept application to Sydney in 2050. • REPRESENTATION(5.10) The student displays no awareness of architectural history as a source of ideas and interpretation. 	

GRADE	WH3N2050/trinity TASK 3. EDMODO JOURNAL: Documentation /Process	score
<p>A</p> <p>OUTSTANDING ACHIEVEMENT</p> <p>10-9</p>	<ul style="list-style-type: none"> The student displays a highly reflective capacity to examine their artist's practice and make insightful, informed interpretations of their journey in the WHEN2050 project by documentation in Edmodo. The student comprehensively documents (text/images) their artist's practice in Edmodo each day they work on the When2050 project. The student consistently communicates to teachers and students in the project, including students in New York The student completes all technical requirements of the task at a consistently high level (through the use of paragraphs, correct spelling, punctuation and sentence structure. The student consistently adheres to the principles of cyber-citizenship in their communication. 	
<p>B</p> <p>HIGH ACHIEVEMENT</p> <p>8-7</p>	<ul style="list-style-type: none"> The student displays a reflective capacity to examine their artist's practice and make some insightful, informed interpretations of their journey in the WHEN2050 project by documentation in Edmodo. The student significantly documents (text/images) their artist's practice in Edmodo most days they work on the When2050 project. The student frequently communicates to teachers and students in the project, including students in New York. The student completes all technical requirements of the task at a high level (through the use of paragraphs, correct spelling, punctuation and sentence structure. The student consistently adheres to the principles of cyber-citizenship in their communication. 	
<p>C</p> <p>SOUND ACHIEVEMENT</p> <p>6-5</p>	<ul style="list-style-type: none"> The student displays a satisfactory capacity to examine their artist's practice and make interpretations of their journey in the WHEN2050 project by documentation in Edmodo. The student occasionally documents (text/images) their artist's practice in Edmodo most days they work on the When2050 project. The student occasionally communicates to teachers and students in the project, including students in New York. The student completes most of the technical requirements of the task (through the use of paragraphs, correct spelling, punctuation and sentence structure. The student often adheres to the principles of cyber-citizenship in their communication. 	
<p>D</p> <p>BASIC ACHIEVEMENT</p> <p>4-3</p>	<ul style="list-style-type: none"> The student displays some ability to examine their artist's practice and make interpretations of their journey in the WHEN2050 project by documentation in Edmodo. The student minimally documents (text/images) their artist's practice in Edmodo on some days they worked on the When2050 project. The student rarely communicates to teachers and students in the project, including students in New York. The student partially completes the technical requirements of the task (through the use of paragraphs, correct spelling, punctuation and sentence structure. The student inconsistently adheres to the principles of cyber-citizenship in their communication. 	
<p>E</p> <p>LIMITED ACHIEVEMENT</p> <p>2-1</p>	<ul style="list-style-type: none"> The student displays negligible capacity to examine their artist's practice of their journey in the WHEN2050 project by documentation in Edmodo. The student makes a token effort to document (text/images) their artist's practice in Edmodo on the When2050 project. The student does not communicate to teachers and students in the project, including students in New York. The student makes negligible effort to complete the technical requirements of the task (through the use of paragraphs, correct spelling, punctuation and sentence structure. The student fails to adhere to the principles of cyber-citizenship in their communication. 	4

Appendix H: Project Assessment Results

Students in Project	Artmaking /20	Art Studying /20	Edmodo /10	Total Mark /50
Student 1	19	18	8	45
Student 2	20	19	10	49
Student 3	18	17	8	43
Student 4	20	20	10	50
Student 5	19	16	8	43
Student 6	20	20	10	50
Student 7	20	17	9	46
Student 8	18	16	7	41
Student 9	20	19	10	49
Student 10	20	19	10	49
Student 11	20	17	8	45
Student 12	20	17	10	47
Student 13	19	18	8	45
Student 14	20	17	9	46
	Average: 19.5	Average: 17.9	Average: 8.9	Average: 46.3

Appendix I: 3dedrats WHEN2050 Exhibition Report

Overview of Event

This 3D virtual world exhibition of Dulwich High School of Visual Arts and Design (DSVAD) students' visions for sustainable architecture was located at the Sydney College of Arts (USyd) as part of the Sydney Architecture Festival. It immersed participants within the student-designed 3D world using floor-to-ceiling 3D video projections as well as allowing navigation through the world using Wii technology. The exhibition also included holographic pods, videos of students describing their work, sketches and a sound track. The event was open 6 days a week for over 3 weeks, attracting attendance from DEC staff and students as well as SCA staff, students and visitors

Dates

Exhibition: 6th – 29th October, 2011.

First Opening Night: 5th October, 2011

Second Opening Night and Drinks with the Dean:
20th October, 2011

Workshops:

- Public: 22nd October, 2011
- Cherrybrook HS: 26th October, 2011
- Sydney Secondary College: 28th October, 2011

Russell Lowe's presentation at Architecture Day:
22nd October, 2011

Outcomes

Attendance

First opening night	350
Second opening night	200
Exhibition	473
<i>Total attendance</i>	<i>1023</i>

Catholic Education Office	2
DEC Regional meeting	20
Granville Boys	10
Observatory Hill Education Centre	1
Cherrybrook High School (workshop)	22
Sydney Secondary College (workshop)	28

Opportunities

- Invited to present the 2011 exhibition at the Schools Spectacular
- Invited to present another exhibit at SCA in 2012

Reflection

Attendance

- Not much passing traffic
- The display outside the exhibition room could be more inviting, as some SCA students were surprised that there was an exhibition there
- Low attendance at Russell Lowe's talk
- Need to have a volunteer outside the exhibit to greet and invite people in. Volunteers couldn't invite passing traffic into the exhibition when doing other activities such as arranging showbags
- Other events (such as accessible art) brought extra attendance
- Visitor's book was very worthwhile. Consider how to best capture who makes the comments, particularly the comments from SCA staff and architects that would have a great deal of credibility
- Time needed to be spent with each visitor to provide an explanation of the exhibition, so it is worth having two volunteers at the exhibition (also required for the interactive aspects i.e. the Wii board). The explanation given or understanding gained by the visitor is what enhances their experience and appreciation for the completed work.

Exhibition

- Video and holographic content should have been more representative of the range of student work, i.e. showing all designs. Holographic displays should cycle through different buildings (foreground) and background images.
- DSVAD students and teachers could have had an explicit recognition (e.g. name and school), with particular notice of Jason's sketches
- The technology used in the exhibition was robust (apart from the Wii)
- The outdoor projectors required action when there was rain, which required additional and ad hoc attendance from Katy
- Attendees should be given a single sheet with a brief general description of the project and exhibition as well as contact details

Volunteers

- Event volunteers were excellent and reliable
- DSVAD Students enjoyed participating in the opening nights and the public workshop, and contributed to these by talking to the public about the exhibition and their designs.
- A script or procedure should be written for all volunteers including the DSVAD students, including some guidelines on talking points about the exhibition (what the attendees are likely to be most interested in to understand the exhibition)

Workshops

- Enjoyed by all, and all students successfully created something
- Further resources could be developed, in particular a print out of activities including an extension activity for students who finish early
- Consider evaluation sheets/surveys for workshop participants (students and teachers)
- Some uncertainty about the workshop bookings – Nerida has promised to book labs well in advance for next year

General

- Folders right from the beginning
- Business cards in folders
- The banners would not stay up even with half bricks, which is an OHS issue
- Provided our own table from the canteen – size of furniture important – needed to have that table
- Wasn't much connection with the rest of the architecture festival, for example didn't know about the other exhibitions that were part of the festival
- SCA staff were very helpful

Specific suggestions for Schools Spectacular

- Will need as many volunteers as possible to explain the exhibition to attendees
- Use mobile devices to communicate the students' descriptions and justifications of their designs

Visitor Comments

Fabulous concept - wonderful work - Marilyn, Mossvale

Awesome, amazing, mind boggling work - Jacqui Green

What fantastic team work to make the most and develop the skills, talent and knowledge of so many! Stacey Allen

Great concept and even greater people with great ideas - wonderful exhibition

I like the 3D part and how they were all different

Congratulations on such an awe-inspiring exhibition! Fabulous teamwork, innovation and creativity on display! Well done - Karen Blackwell

Absolutely amazing exhibition. Thank you for showing us around. Astonishing - Kurringai West Probus Club

Really talented!! Good job by Sydney University MDP students

Interesting project very original. Loved the Music too!

So talented! Can't believe it was created by Yr 10kids!

Awesome! SCA painting student

What a wonderful exhibition. Looking forward to coming back on 22 October to see it during 2011 Sydney Architecture Festival - Jo A.

WOW! I hope one day it becomes real.

I found it refreshing to find architectural modeling that valued our fuller lifestyle and human needs. If you have taken the symbiosis and larger needs of the world (not just human accommodation and food needs further, I reckon you would have aced many architecture students (a sculpture in clay who can't draw but can spatially express and build 3D!)

Very creative and most enjoyable.

A very stimulating use of technology which gives freedom to students' imagination. The combination with blogging and traditional skills of sketching is valuable and important to extend students' ability in other forms of communication. It would be interesting for students to evaluate their work in relationship to principles and elements of design apart from other criteria inherent in evaluation

of their work and peer assessment. Well done everyone. Kate.wilkie@sydney.edu.au

Very articulate students, capable of critically explaining some interesting ideas. Enjoyed the symbiotic designs of the virtual city. Excellent.

A wonderful creation by very talented children. Good luck to them all in the future.

It was like an adventure - Jenna Howe

It was like someone playing a game- Ben Howe

Brilliant project....wow - N. Williams

It was really cool and amazing to think a bunch of kids created such a cool cyber world!

It was fantastic and really, really awesome- Lucy W.

Fantastic exhibition! Just wonderful to be able to explore a futuristic world in such a realistic way!

It was such a fantastic show. Max, Nicholas and I loved it

A vision for the future!

This was great. I think more schools should be doing things like this.

This was an awesome experience from works that were created from young Year 10 students! Keep it up!

Love it!

This exhibition is fantastic! NSW DET should be getting involved in this technological generation.

This was a great project!!! Well done guys! And can't believe my eyes - done by Year 10 students.

I wish that I learnt this stuff in school- Amazing stuff guys!!

Very sophisticated approach, very interesting

Inspiring to see an integrated and collaborative response to the dilemmas of our times!Fantastic!

Hey that's a fantastic exhibition. Can't believe it was done by kids - Amazing! Steve

Keep doing what you love!

Seeing kids work in the same spaces that we are used to looking at artists with careers is really refreshing. Not a lot of people think about showing young student works but by doing this I think can give those students and even on looking students a nice sense of power.

Hello, I thought your virtual world was great! Good

job. I was really impressed with the quality of your world. Loved the waterfall and water tunnel

I thought the concept was excellent and well done with using the 3D software. It's great to see 16 year olds thinking about the future

Can't believe this is done by students at high school, good work!

Brilliant innovation - this is the future of visual arts education. It will extend the gifted student and motivate the disengaged. Terry

Fabulous:inspiring and so imaginative

To all the students, congratulations- absolutely fantastic results

Very impressive new and future concepts! Well done!

Keep up the food work! Really impressive!

Wow amazing works. Congratulations and keep up.Go 2050!!

Fantastic work! Can't wait for 2050

Absolutely 100% impressive

Wow! Amazing! Congratulations 2050 here we come!

Fantastic work! Well done Marcella Balt

Love it! Keep up the good work! Mariclare Malone

Very impressive and an outstanding example of quality teaching/quality learning.

Very impressive and engaging for students.

That was one of the most amazing examples of student learning I have ever seen. S. Papp

Well done everyone - great collaboration and heaps of fun!! Christine Black

Amazing. Year 10 students that is incredible. I look forward to the next generation designing a sustainable developed future.

That's wonderful work! Hope you will get more opportunity to do this! AJ

I was amazed at the level of complexity and detail. Great work and hope to see more next year. Very creative! Joe Harris

Wonderful trip to SCA to view the 3D 2050! Thanks, especially Concetta for your inspired chat! Michael Waters

Fantastic exhibition detailing amazing depths of

learning for students! I'm overpowered by the possibilities. Thank you D Riggell CEO LTF Eastern Region

Congratulations all! Dell Walker

Large screens pushed me into the second life world , great.

The concept is brilliant and the design was well put together.

What great imagination. The future looks fantastic!

Really awesome exhibit! It would be awesome for these buildings to be actualised in the future!! keep up the good work (No Great Work!)

This is a great opportunity for all to explore, discuss and develop a very complex project.

Congratulations to all involved.

This was awesome! I had never seen something like that before. Congratulations

Very imaginative and very well presented.

Fantastic stuff. It is great to see high school students that are interested in environmental sustainability. They also are very creative and I hope more opportunities like this become available to more high school students.

Interesting ideas. The groups really different in eir ideas of future design and the roles of aesthetics. An impressive amount of detail and thought considered the time they were given.

Intriguing exploration of mid 21st century living. Great ideas and wonderful execution I'll be back to hear how you managed it. Murray Scott

Great work! It's great to see people being exposed to technologies of the future. Meghan

I enjoyed seeing your virtual world and was very impressed when I found out that you boys and girls were in Year 10. Congratulations. Barry Hale.

Something I would never have been able to achieve at that age (or any age!) – Holly

Great job! Good to see how much students learnt and how it could be applied across other subjects. Well done

Looking forward - a 6 x D world!

Fabulous! Bradley

Fantastic work in only 10 weeks! Well Done everyone involved. Also great layout in the gallery. Wonder if these buildings will come to fruition in

2050! Liz Land Visual Arts Teacher Liverpool Girls High School

Water hotel was the best!

Very amazing

Amazing what you young kids can do!!! Imagine your future . Great work guys and girls.

I want to work in an egg please. Pat – FOM

Very, very cool! Loved the backgrounds info the kids on the video gave us - Gaye – FOM

A time has arrived, excellent now - Simon Chant

What outstanding learning for students! What we have come to know and expect from the deep knowledge of the Macquarie ICT Innovations Centre

Congratulations - I can't believe Year 10 students have created this fabulous 2050 lifestyle for us to look forward to. love Victoria

Some Creative ideas! Matthew Burley Keepad Interactive

Very impressive design ideas and professional demonstration. Ed Hone Keepad

I am inspired and love your vision. Best luck Margot Currey

Incredibly impressive. Well done and keep it coming!! Charlotte Keh

Fantastic program and creation – LOVED my 'TOUR' thanks to JAN. Janelle Paisley

Extremely interesting, Great opportunity for these young people – Jan Elliot, Aberdeen, Scotland

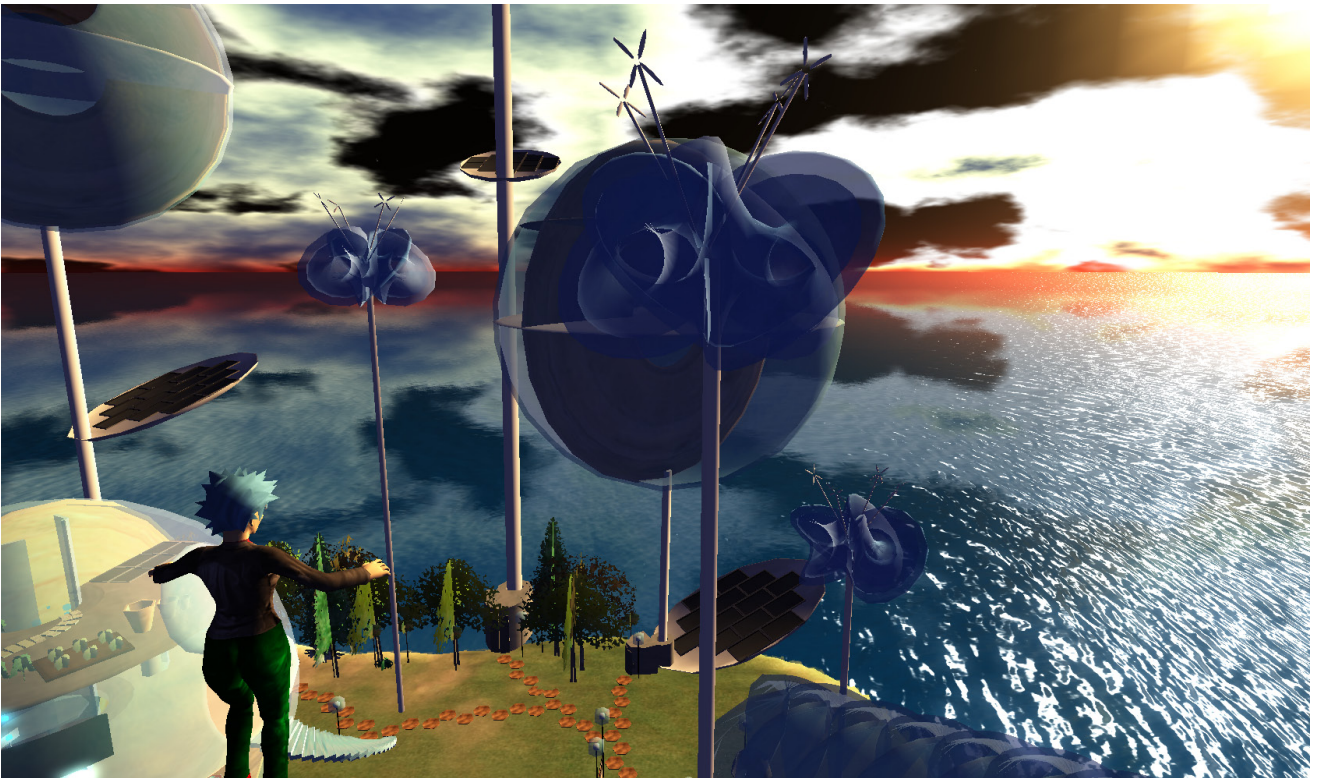
"Brilliant work by these 'to-be-architects'. Extremely inspiring to realise such natural abilities and insights in these works. Keep going and develop these insights and activities at home and school. There should be more of these attempts and projects in other fields throughout all schools in Australia. Highly commendable effort by all. Thank you for your insights." - Kitt Gorn (Architect) 27 October 2011.

Branding and Images



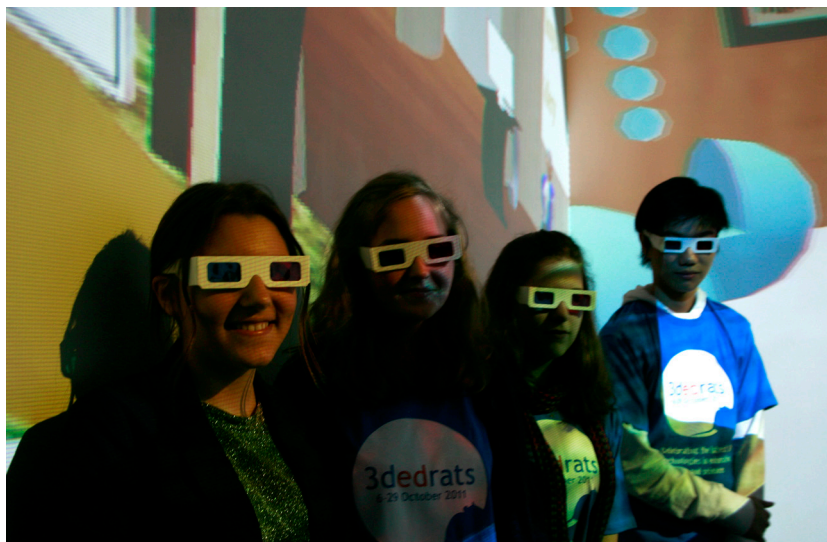
WHEN2050

EXHIBITION: SYDNEY COLLEGE OF THE ARTS



WHEN2050 Exhibition of student work at the Sydney College of the Arts open throughout October 2011





Project students at the WHEN2050 opening night at SCA



Projections Inside the exhibition



Visitors listen to students speak about the project

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