

FINAL REPORT FOR A 1999 NATIONAL TEACHING DEVELOPMENT GRANT (INDIVIDUALS)

IDENTIFICATION

Name of Project Leader(s)

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Project Title

Pathways into a maze

Key words or phrases that describe the project

- Building Construction
- Architecture and Building Students
- Computer visualisation
- Virtual access to construction sites
- 4D multimedia Oracle relational database
- Virtual reality interface
- Translations between documentation and building
- Self paced and visually oriented learning
- Internet based

2) Executive Summary

Aims and Objectives

Teaching framework

Construction sites should be ideal locations for students to learn about current construction however they can be intimidating and confusing environments. *Pathways into a Maze* was constructed to help students make sense of activities on sites and to develop their knowledge and powers of observation so they can undertake independent site visits.

Background

SSV

Pathways into a Maze developed the teaching potential of a 4D relational database called *Simulated Site Visits* (SSV) which was begun with the financial support of a 1997 CAUT grant. Using a 4D Oracle relational database, SSV allows students to undertake virtual site visits to buildings under construction. Students manoeuvre through VRML models of buildings on different site visit dates, clicking on icons to look at photos, drawings or a range of other resources.



<http://get.to/ssv>

Note plug-ins are required for VRML interactivity.

Pathways into a Maze

A street directory

SSV contains many photos and other resources of buildings under construction. The complexity of this 4D landscape risks students getting lost in both space and time. The focus of *Pathways* has been to give students a range of tools to help them structure and focus their visits into SSV. We found it useful to consider the analogies of street directories, scavenger hunts and signposted pathways when structuring the support tools.

Early strategy

We made a breakthrough decision early in the brief development that greatly simplified our task. We had assumed that the support tools would be located within the Oracle database and were concerned about the complexity and expense of programming. When we shifted our thinking to providing the range of tools within subject web sites, the development became more comprehensive, straightforward and accessible by students.

Learning outcomes

Using subject web sites it has been possible to interlink with SSV in a range of ways. Signposted pathways into the information link with lecture programs as well as SSV. Students' drawn interpretation of architects' working drawings can be checked against photos within SSV and a flexible search tool allows compilation of resources. These tools help students study the translation between the quite abstract processes of design to the concrete processes of construction. Gaps can be discovered and explained.

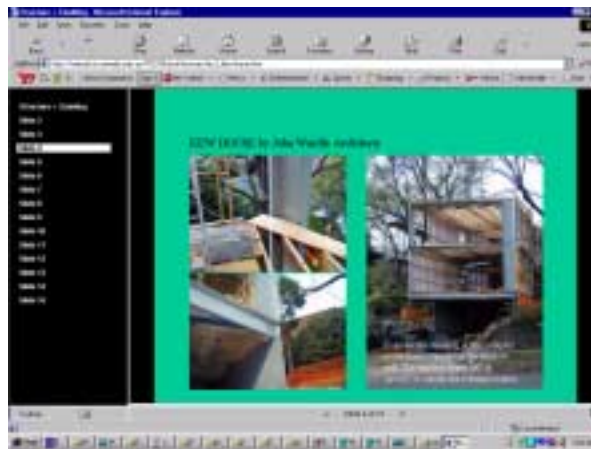
3) Justification and educational rationale

Case study learning

Site observation gives students access to current and local construction information that is not available from any other resource. The commercial building industry is changing quite rapidly with the development of new technology. Students need to complement construction texts that are often some years old and based on overseas case studies with buildings using current and local construction techniques. Unfortunately regular site visits are becoming increasingly difficult due to larger student numbers, cost, time and health and safety issues.

Guided visits

Site visits become more useful as students begin to understand what they should look for and which questions to ask. Sites can be confusing and intimidating to students. Part of the aim of Pathways has been to coach students to help them observe.



Guided signpost used in lecture notes and available from students' web site

<http://go.to/ct3b>

'Consider the detailing of this complex portal frame supporting the window wall. The window frame will sit 'proud' or outside the column location.

In the above example, images uploaded into SSV during the development of *Pathways* were used in a lecture on steel. Suggestions were made to students on what they should look for.



<http://get.to/ssv>

This VRML shows resources available for one site visit. Note the time bar in the bottom left frame of SSV with site visit dates indicated by dots.

Students can then toggle between the guided tour of this award winning building by John Wardle into SSV where they can undertake a more self-directed walk around or into the VRML model of the building. The icons that appear to be floating in space are accurately located wherever there is a site photograph or other record for that site visit date.

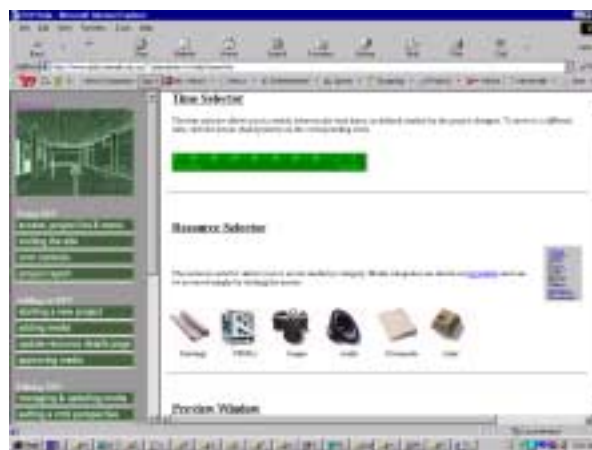
Unpeeling layers

Within SSV, photographs taken from one angle over time are linked to allow students to view the construction progress or unpeel layers from the finished building to reveal the structure below. The views below are taken from one of these series. These are useful for students to consider the construction speed.



SSV Help

A fundamental aim of SSV was for students to collect, annotate and upload images from their own site visits. An extensive 'Help' section was developed as part of *Pathways* and test groups of students have uploaded site observations in the last two years. We have decided that this process is too complex and should not be done by students.



Detailed notes on using SSV and uploading images were developed as part of the *Pathways* project.

Translation drawings

3D drawing models by students developed from 2D architects working drawings complement the site photographs and enable comparisons to be made between the abstract 2D architectural working drawings and the built form.

Student exercises

In a range of formats, students are asked to access the information within SSV as part of the *Pathways* development. They can compare architects' working drawings against what was built looking for gaps or they can predict the construction process from drawings and check it against the dated photographs. Two take home exam questions are based on this type of research.

4) **Target student group**

Architects & Builders

It is anticipated that SSV and Pathways will be explored by all students studying Construction Technology in the first three years of architecture and building. This totals a little over 600 students each year. While SSV is introduced to students in the first two years and lecturers make use of the resources, the most active use is made by 150 third year students. This is appropriate, as students at this level are more able to amalgamate knowledge from a range of sources.

5) **Technical soundness**

Virtual site visits

'Simulated Site Visits' (SSV) was at the cutting edge of technical feasibility when it was first developed. Over \$100,000 of Oracle programming time was donated when the task became more complex than first anticipated. The complexity has caused ongoing difficulties in getting refinements made that might achieve a more straightforward interface.

Uploading by students

For example, we have now decided not to pursue our fundamental aim of involving students in the collection and uploading of new sites as the task is too complex even with the comprehensive 'help' menu. We have been more than compensated because architects and builders are increasingly keeping extensive digital photos of their own buildings.

Web-design

The decision to keep most of *Pathways* linking into the Oracle SSV database rather than within Oracle, has been a more efficient use of programming time and has enabled the upload of more projects than anticipated. SSV and *Pathways* are now a rich source of construction information that would otherwise not be available.

6) **Administrative Convenience**

Bandwidth

The early design anticipated the increased bandwidths that have now enabled the complex visual information to be downloaded at an acceptable rate particularly within the university network.

Access & Plug-ins

SSV uses quite a few plug-ins. Along with downloading times, this has meant that students are normally limited to accessing SSV within the Faculty's computer laboratories. Our labs are currently sufficient for students and so access has not been of concern. Occasionally there have been problems with the availability of the necessary plug-ins.

7) **Organisational Acceptance**

Oracle

The Faculty has indicated that it will not continue to fund the maintenance charge for Oracle in 2002. However, the Faculty is very supportive of this multimedia development and several options are currently being discussed.

8) **Evaluation**

External & Internal

Evaluation was undertaken by an educational technologist who tracked student and staff use of the multimedia tools. Initially we found the resources, particularly the timeline, were not being fully discovered by users and so emphasis was placed on revealing these aspects in

Pathways. Feedback from students and staff is still being used to adapt aspects of *Pathways*. Quality of Teaching scores increased over ten percent in 2000. 2001 feedback is not yet available.

Other applications

The tools developed have been presented at a range local and international conferences with positive feedback. The multimedia development is still an unusual and intensive use of time related visual information deliverable over the Internet.

9) Publications on simulated site visits and pathways

(* = Refereed publication)

- *Newton, C., 'Peering Through New Glasses' in *Formulation Fabrication*, ed D. Kernohan, A. Leach, E. Petrovic, P. Richardson, M. Taylor & P. Wood, The Society of Architectural Historians, Australia and New Zealand, Wellington, 2000, pp197-204.
- *Newton, C., 'Bringing the Coal Face to the Cutting Edge' in *Architecture + Education*, ed G. Moore & L. Trevillion, TAASA Association of Architecture Schools of Australasia, Sydney, 2000, pp103-108.
- *Newton, C., 'Constructed Views' in *Architecture + Education*, ed G. Moore & L. Trevillion, TAASA Association of Architecture Schools of Australasia, Sydney, 2000, pp81-86.
- *Newton, C. & Burry, M., 'Building Architecture: using sticks, stones and computer visualisation, *Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia*, ed B-K. Tan, M. Tan & Y-C Wong, Centre for Advanced Studies in Architecture (CASA), Singapore, 2000, pp 511-519.
This was a joint paper with Clare Newton as the first-named author but equal contributions by both authors as lecturers at different universities.
- *Newton, C., 'A 4D Multimedia Landscape' in *INCITE 2000*, ed H. Li, Q. Shen, D. Scott and P. Love, The Hong Kong Polytechnic University, Hong Kong, 2000.
- *Newton, C., 'Are Builders Designers?' in *Property and Construction Education and Research*, ed R. Kenley & S. E. Chen, AUBEA Res., Australasian Universities Building Education Association – Research, Melbourne, 1999
- *Newton, C., 'Architecture as Alchemy – Changing Documentation Languages and their Translation into Built Forms', 1998 IEEE Conference on Information Visualisation, ed E. Banissi, F. Khosrowshahi, and M. Sarfraz, IEEE Computer Society, Los Alamitos, USA, 1998.

Showcase events

- Finkelstein, J & C. Newton, *DITAM 99 Doing IT at Melbourne Uni*. A symposium of multimedia developments with the university.
- Newton, C., *METTLE 2001 Multimedia and Educational Technology for Teaching and Learning Enhancement*, (to be held in November, 2001)

Articles on Simulated Site Visits and Pathways

- Finkelstein, J., *Oracle at Work*, 15 March 1999, <http://press.oracle.com.au/oracle/oaw/19990301.html>
- Illing, D., 'Charting Pathways into a Maze', *The Australian*, 9 December 1998, 43.
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Appendix A Team Members and Acknowledgements

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Applicant and technical advisor	Jonathan Finkelstein,	Academic
Key technical contact person	Adam Dean, Technical Assistant	
Collection and interpretation of on-site material	Seona Gunn,	Architect
Oracle Programmers	Steve Wright &	S & K Wright Neologistics

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- Robson, Colin, *Real World Research*, Blackwell Publishers, Mass, 1993.
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Appendix C Contact Details

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