

The Construction Primer in Case-Based E-ducation: The Deakin Woolstores Case Study

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http://www.ab.deakin.edu.au/online/woolstores_casestudy/default.html

This paper outlines the use of an online multimedia case study of the Deakin University Woolstores campus in design and construction learning. The case study, in its pilot form, serves three purposes: as a case-based primer for the study of design and construction technology, as a structured case-study container for the addition of student digital construction projects and to benchmark student digital construction projects. The case study utilizes 3D CAD models and web-based multimedia in concert with physical connection with the actual building to build wholistic understandings of the transition of an idea to a constructed reality.

Keywords: Multimedia case studies, construction and design education

Project Background

The Woolstores Campus multimedia case study that forms the center of this paper has two defining influences. The first of these is the Construction Primer, initially developed by Prof. Mark Burry and currently in development at Deakin University, Victoria University of Wellington (VUW) and University of Arkansas. The 2002 Construction Primer contains multimedia information on construction materials, detailing, construction practice, environmental impact, resource issues, and construction related legal codes and standards. Resources are shared amongst participating institutions, with resource creation undertaken by Deakin and VUW students in coursework and through summer research scholarships. (See Burry, 1995, 1997, 2001 etc)

The second defining influence on the case study is the CUTSD 'Reflective Making' project. Since 1999, Deakin University's School of Architecture and Building, the University of Adelaide and Victoria

University of Wellington have undertaken a collaborative project funded by the Committee for University Teaching and Staff Development (CUTSD).

As part of the project, students and staff from the three participating institutions developed resources and curriculum for early-years built environment tertiary education over the summer of 2000/2001. (Woodbury et al 2001) These included digital resources (3D CAD models, images), physical resources (architect's and consultant's drawings, project information) and multimedia 'construction games'. (Ham 2001) During the summer of 2001/2002, a further group of five Deakin students were funded by CUTSD as 'developers' to create a multimedia case study.

Case studies have been utilized widely in education as a framework for deeper learning. (Wyeld, 2001) The case study, as a 'multi-faceted interpretation of a thing or things in the world, ' sought to

'ground new learning in the concrete context of a realized work'. (Woodbury 2000). Award-winning architect-designed buildings were case studied as part of the CUTSD project as a tool to allow early-years students to 'learn how to learn' through applied research, enhanced by the use of 3D CAD models and web based multimedia. Case-study buildings were chosen for their representation of design and technological excellence within a range of typologies and uses. Resource sharing was integral to the project, as each school's case study was made available as a learning resource to others.

The Woolstores Case- study.

In this paper, we outline a specific case study to illustrate construction and design learning facilitated through digital media. The case-study building selected at Deakin was the Deakin University Woolstores (Waterfront) Campus by architects McGlashan Everist, a RAI A National Award winner in 1997. (Figure 1a) The Deakin student developers harnessed a large body of resources on the case study building, including architect and consultant documentation, briefing information, specifications and thousands of construction photographs. These resources are held within the school for further development and for use in architecture and construction management courses.

Deakin Woolstores campus is representative of a wide variety of construction technologies, materials and processes and thus is most suitable for study. Timber, steel, concrete and brickwork technologies are represented within an adaptive reuse framework. (figure 2a) A defining attribute of the Woolstores design and construction process was integration of new work within the fabric of six distinct 50-100 year old timber and concrete framed wool storage buildings. 'The formerly dark, impregnable building has been transformed with spaces of generous proportion and light' (RAIA 1997)

The Deakin University Woolstores case study was developed for three main reasons:

As a case-based primer for the study of design and construction technology;

As a structured container for the addition of student digital construction projects: a 'living case-study' wherein 'student research work is worth more than course assessment'. (Burry 1995)

As a pilot for benchmarking student digital construction projects. The case study, developed by colleagues, showed students what can be achieved.

The case study, at this stage of development, constitutes three parts; project introduction and general information, the 3D CAD building model 'container' (figure 1b), images of the building and multimedia studies of construction details and



Figure 1. (a) The Woolstores Campus (left) and (b) case study web page with cut-away section of rendered 3D model (right)

assemblies (figure 2a). The media utilized in the case study included Flash, Dreamweaver, Microstation, Rhino, 3D Studio Max and graphics software. The primary resource for the case study was the development of a Microstation Triforma model of the whole campus. The model was developed from AutoCAD 'as constructed' architectural drawings, confirmed by surveying and measurement of the actual building. The model was constructed and rendered for web delivery to allow the exploration of the case study level by level.

Construction Assembly Studies

A major component of this pilot case study was the development of web pages on individual construction assemblies of the building. Construction assemblies were selected for study based on the way generic construction details are designed within a project-specific context. The design intent embedded within assemblies under study reflected core issues within the Woolstores project. 3D model resources were developed through the CUTSD project by research scholars and through a 3D CAD modeling unit. (Outlined in Datta and Woodbury 2001).

In the 2002 pilot, eight construction assemblies were developed, each comprising five inter-related

elements:

Description: A rendered image of the 3D model with rollover descriptions of constituent materials and components. Descriptions include a brief outline of why the technology is utilized in this situation (figure 2a);

360 View: A rotating view of the rendered CAD model, developed using a feature in Macromedia Flash. This was used as an alternative to VRML (Figure 2b);

Construction Sequence: QuickTime animations of the construction assembly in construction sequence.

Construction Images: Images of each construction assembly during construction taken from Clerk of Works photographs;

Current images: Images of the finished assembly included to provide a visual record of the outcome of the design and construction process.

The intention of this case structure is to build understandings of design and construction processes, construction technology and the finished assembly.

Using the Case Study

Students interact with the case study in a number of ways. Firstly, it is currently used as a case-based primer for the study of design and construction



Figure 2. (a) Actual construction assembly (left) and (b) 3D model study of construction assembly (right)

technology to complement the Construction Primer, course materials and digital construction projects. This multimedia resource complements the existing Primer with a focus on construction technology as the outcome of a design process. From this, students develop understandings of the principles of construction both in concept and in action. The second use, as a structured container for the addition of student research projects requires students to add their own research to the case study. 150 students enrolled in the second year Construction and Structures 2 unit have recently completed a digital project that integrates 3D CAD modeling and web page design with research into Woolstores construction assemblies. These projects are submitted online, posted into a Virtual Gallery for peer learning and assessment. A selection of the best projects will be linked to the Construction Primer Woolstores Case Study website. In this way, the Woolstores Campus becomes a 'living case study': a vehicle wherein students both learn from, and contribute to the learning resource. (See http://www.ab.deakin.edu.au/dotcp-submission/vgallery/srt251_2002_project2.htm) As with any resource, the veracity of the information is critical and thus student work requires moderation. With the pilot container developed, future directions include the verification of student research material from consultants, clients and industry organizations.

The third use of the case study is as a benchmark for student digital construction projects and as an exemplar for the use of digital media to facilitate the understanding of construction technology. Students learnt skills, through digital construction projects, to communicate construction understandings through digital media.

Conclusions

Digital media has been utilized to unlock the construction knowledge embodied within the case study building: direct proximity to the actual building allows the confirmation of digitally acquired knowl-

edge physically. Between the two, it is contended a deeper understandings of construction technology may be achieved. Further research will determine the efficacy of this multimedia case study and related digital construction projects as tools for deeper learning of construction technology and design.

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