The Silk Road: An Interactive Online Encyclopaedia as a Foundation for Networked Education in Design

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Abstract

This paper describes a multidisciplinary design studio project conducted in Spring 2000 titled "*The Silk Road*". The studio is an implementation of an innovative initiative in design education known as Networked Education in Design (NED) and is a further component in a series of on-line, interactive design studios under development at the Hong Kong Polytechnic University School of Design. NED is an educational philosophy, a pedagogical strategy encompassing several different aspects of Internet and Intranet communications, multimedia and shared learning environments, with the goal to decentralise the campus experience, enhance the local-global academic dialogue, and create an interdisciplinary, extendable and flexible virtual learning environment. In the case illustrated here, NED was manifested as an "*Electronic Encyclopaedia*" exercise designed to provide a universally applicable body of knowledge for students to use in design studios within their field of study, resulting in a rich and diverse body of work which in its disciplinary diversity manifested a common epistemological root.

Resumen

Este trabajo describe un proyecto de estudio de diseño multidisciplinario llevado a cabo en la primavera del 2000 intitulado "La Ruta de la Seda" (The Silk Road). Este estudio es una implementación de iniciativas innovadoras en la educación del diseño conocido como Networked Education in Design (NED) y es un componente más en una serie de estudios de diseño interactivos y en red, en desarollo en la Escuela de Diseño de la Universidad Politécnica de Hong Kong. NED es una filosofía educativa, una estrategia pedagógica que agrupa varios aspectos diferentes de las comunicaciones de Internet e Intranet, de multimedia y de medios de aprendizage compartidos, con el gol de descentralizar la experiencia del campus, mejorar el diálogo académico local-global, y crear un ambiente de aprendizage virtual que sea interdiciplinario, expansivo y flexible. En el ejemplo usado aquí, NED se presentó como un estudio llamado "Enciclopedia Electrónica" (Electronic Encyclopaedia), proyectado con el propósito de proveer conocimiento de aplicación universal, para que lo utilicen los estudiantes en proyectos de diseño dentro de su campo de estudio, dando como resultado un rico y variado trabajo el cual, en su diversificación disciplinaria, manifestó una raíz epistemológica en común.

Networked Education in Design (NED)

NED studios critically examine the need and relevance for online teaching tools and methods, and the usefulness of existing, generic systems such as WebCT as opposed to designing and building tailor-made project-specific tools. It differs from most other virtual studios in that it enhances, not replaces, the physical interaction of students. This is seen as key, as it is certain that so-called virtual interaction will never eradicate the need for physical meetings. Most virtual studios emphasise the remote, asynchronous collaboration of unrelated students. While this a useful way of breaking down geographical and cultural boundaries, it by definition must function on lowest-common-denominator terms, and it does not address the much more urgent subject of local interaction and global dialogue.

The *Silk Road* builds on, and complements, previous NED virtual studios. The studio functioned as a two-stage course over the length of an entire semester. During the first part of the project, students from the School of Design's five core disciplines (Environmental, Industrial, Visual and Fashion Design, as well as Design Criticism and Theory) operated as members of nondenominational research teams, whose task it was to explore, contribute to and develop an on-line *Electronic Encyclopaedia* in terms of content and relationships. The students then extracted meaning and concepts from the encyclopaedia, which they used as a foundation for developing individual, discipline-specific projects in a studio environment. The value of the *Silk Road* project lies in its role as an *epistemological foundation* for the students' work, forming a common root of related ideas traceable through in the projects of over 100 different students in 5 disciplines.

The *Silk Road* was developed as a *courseware* set of online tools based on a common core website system, acting a central reference point, a virtual beacon for all participants to orient their actions by. In order to implement all possible aspects of student contributions and carefully monitor and track team and individual performance, the *Silk Road* was implemented as a Client-Server model. Users could access the system with a web browser, and all aspects of logging, information processing and data visualisation were processed server-side through an extendable set of custom-built CGI tools. The advantage of this

approach is that the users (staff and students) are not distracted by client operation, and that the tool set on the server can be modified and enlarged as required. The *Silk Road* system maintained track of the growing set of virtual links while graphing emerging and evolving hypertext constructs. The students and faculty were all located on the same campus (Hong Kong), with global external visitor participation (HK, USA, Europe and Australia), both physical and virtual.

The Silk Road system represents a new instantiation of a different type of virtual studio courseware system, which complements the ongoing discussion of virtual learning environments and online teaching. The Electronic Encyclopaedia formed the basis of the larger Silk Road design studio, as a universally applicable body of knowledge for students to use within their specific design discipline, resulting in a rich and diverse body of work which in its disciplinary diversity manifested a common epistemological root.

The Silk Road Studio

Design Study 6 – Design and Human Futures used the theme of the *Silk Road* as a metaphor for our location as human beings and designers in space and time, where cultural and technological developments influence us as designers and determine our projection of the future. The *Silk Road* is a watershed project: it denotes 'half-time' in the progress through the students' Degree course, and marks a transition from working on common design studios to working individually and in-depth within students' selected area of 'specialism' (major field of study). In this sense, *Silk Road* focused on intellectual depth and breadth, while demanding a high degree of design sophistication and technical accomplishment in project development and execution within a student's area of focus. Its many facets contributed to the richness of the course over a semester-long (14 weeks) period.

The *Silk Road* studio was organised in phases that were monitored and assessed by *Checkpoints* (critiques and presentations) throughout the course. This organisation meant that each student was aware of exactly what his or her responsibilities were at each stage, as well as being able to monitor his or her own performance through an associated *Online Marking System* (see below).

In Phase I, the students were required to build a common body of knowledge, which would serve as a common well of cultural, social, political, geographical, historical, economic and technological themes for all students to use throughout the entire *Silk Road* studio course. This was done by using the *Electronic Encylpaedia*, an online knowledge-ware system which acted as a form of online compendium. Students were divided into groups of two, working on intellectual content which was not specific to their area of specialisation.. These groups were formed randomly by name, taking into account that each student should not be from the same specialisation as his or her partner. Group supervision was assigned to one of the studio tutors, who in turn were a different specialisation as their groups, where possible.

The *Electronic Encylpaedia* system represents a different type of virtual studio courseware system and contributes to the ongoing discussion about virtual learning environments and online teaching. It differs from the previous online teaching project (Design Study 4) which we created within the NED context (Falk et al., 2000), in that *Electronic Encylpaedia* system established the empistemological foundations for the students' subsequent design projects. The system was used in the first 3 weeks of the *Silk Road* design studio.

The second part of *Silk Road* involved the students working as individuals working with their specialisation-specific tutor on in-depth projects, developing their own critical *return briefs*, which they generated by cross-referencing ideas and concepts developed within the *Electronic Encylpaedia* to create a rich, critical yet theoretical design premise (Phase II). The students then had to justify and respond to this brief with a complex piece of individual, specialisation-specific project (Phase III). This project demanded a high level of insight and execution both in terms of theoretical depth and breadth as well as accomplishment in execution and presentation. While students worked specifically with their specialisation tutor, who was responsible for their grades, on the main project, the entire *Silk Road* team continued to serve as interdisciplinary advisors to provide input, criticism and support.

The Electronic Encyclopaedia System

The students were asked to create *a common body of knowledge* upon which their actual design work was to be based later on. To facilitate this first work phase and the access to collected information, we developed an online learning application called *Electronic Encyclopaedia*. It was implemented as a HTTP-based client-server model, using standard WWW browsers on the user's side and a collection of open source software including

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LINUX, Apache and mySQL running on a medium-sized desktop PC on the server side.

In its initial state, unlike a common print encyclopaedia, *Electronic Encyclopaedia* is an "empty" collection of terms collected as entry-points to the course subject. We chose about 200 basic terms which relate to the idea of "Silk Road" to 'seed' the system. The students' task is then to upload definitions to the encyclopaedia in the form of plain text, binary multimedia files, online links or physical objects (see below). An arbitrary number of definitions is allowed for every term. With every definition given, students can assign cross-references of the type '*see also: foo*'. Those cross-references can either be directed to already existing terms or to not-yet existing ones which are then added to the list of terms, keeping it growing dynamically.

Next to the list of terms and the description contents, the encyclopaedia's GUI contains some navigation buttons, links to statistical data, to an integrated keyword search engine and to a graphical display which is also loaded on session start-up. This display represents every term in the encyclopaedia as a circle, whereas the circle's colour represents the popularity of the term: More clicks result in brighter colour. The cross-references between terms are represented as red lines. To give users an immediate feeling of the very responsive, fast-evolving nature of the encyclopaedia, the visualisation is generated in real-time at every single request, instead of serving a cached visualisation which is generated at a certain time interval. Eventually during the course, this luxury collided with tremendous performance peaks as they occur when networked education involves studio interaction and online interaction: We found that the moments after studio briefings, when high numbers of students are inspired to work on the system, are particularly critical in terms of server-sided system load. When the encyclopaedia had grown to more than 2000 descriptions, a single content visualisation run was so memory-consuming, that the server was unable to handle several requests at once and crashed. At that point we had to replace the dynamic visualisation with a static version. In order to provide immediate visual system responses to learner activity we have already started to experiment with low-cost server clusters to provide sufficient computing power for real-time data visualisation in future NED applications. We regard real-time graphics not only as an essential strategy to inform learners about current content structures but also as an important way to encode learner-observation protocols. We have shown this in contexts of exclusive online learning providing a visual substitute for interaction observation in traditional studio teaching (Falk et al., 2000).
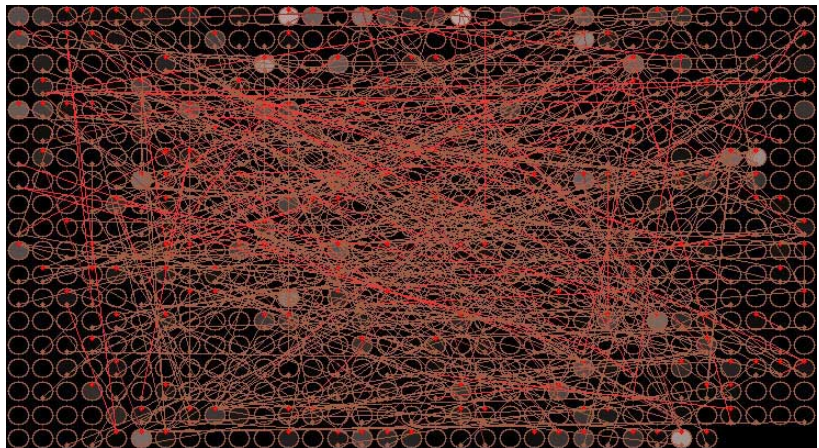

figure 1 - Graph charting meanings and relations in the Electronic Encyclopaedia.

Shortly before the beginning of the course we recognised the system's insufficient capability to handle information beyond its own software boundaries: Definitions of terms were only possible in formats feasible for digital upload. Physical objects such as books, stones, fruits or coins had to be scanned and could only be stored as their own digital representations, which was either very inefficient as in case of books, or not suitable to convey features such as tactile qualities. Thus we enhanced the system's digital memory with a spontaneously cleared book shelf from our lab and set it up in the studio. With an enhancement of the internal database specification and some extra features in the system's GUI, the encyclopaedia was also able to handle physical objects by generating index numbers which had to be attached to objects on the shelf. Understanding a software project not only from the user's perspective but also as developers with full access to its source code, we were in full control to adapt our learning system. Where solution strategies have to be constantly monitored and changed as it is the case in teaching situations, to us this quality has proven to be essential. The second application developed for this course is an *Online Marking System* running on the same server. Its development is

a reaction to the poor design of available online marking systems which could not provide us with facilities to configure access rights for multiple teachers, to set up an arbitrary number of course milestones with different arithmetic weights for final mark calculation and an arbitrary number of milestone partial marks with free-form descriptions. Students could access the marking system to view their personal record, and tutors could access it for a course overview and individual marking where the permission was provided according to an initial division of responsibilities. The context-oriented nature of the marking system and its residence on the encyclopaedia server allowed a very productive system integration: The interface for marking a student's performance throughout the initial research phase until *Checkpoint A* displayed a full list of this student's encyclopaedia contributions for quick reference and comparison.

Conclusion

In our view, the *Electronic Encyclopaedia* courseware was effective at various levels and in various ways. Firstly and foremost, it empowered students with a sense of ownership – the *content* of the online knowledgebase was entirely theirs, as were the meanings and relationships constructed and mapped that were generated from it. This is fundamental in that it entrusted them with the responsibility for the content of their work and the relations that would emerge between their own ideas and those of others. Every single student in the cohort participated in the teamwork and completed the Phase I requirements; at the end of the 3-week period, the *Electronic Encyclopaedia* contained 741 terms with 2556 descriptions. Students learned firsthand about the rich relationship that can exist between 'real' and 'virtual' knowledge processing, and how the virtual site can enhance collaboration in the studio, facilitate local and global communication, and improve work performance through electronic data sharing.

Furthermore, the students developed enough self-confidence in their conceptual ideas and constructs to successfully generate and map individual return briefs to discipline-specific projects. For example, the Environmental Design students led by Cristiano Ceccato, complex briefs were created and adapted to the problematic urban dystopian area of Hong Kong's former Kai Tak airport, generating a new series of public infrastructural interventions aimed at transforming the site in local, regional and global terms. In short, by basing design work on the strong foundations created in the *Electronic Encyclopaedia*, students were able to tap the full potential of their ideas and motivations.

figure 2 – Online critique between students in Hong Kong and London.

Finally, the *virutal-to-physical* relationship of the *Electronic Encyclopaedia* set an early trend for the entire *Silk Road* studio. Again in the example of the Environmental students, over 80% of their teaching was conducted in the School of Design's Global Virtual Design Studio, which permits students to explore, present and explain their work in a variety of projective and immersive media. This culminated in a series of online workshops and a joint presentation / critique of their work with student at the Architectural Association in London, further demonstrating how geographical barriers can be overcome in constructive

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ways; the online critiques did not replace face-to-face studio discussions, but rather enhanced discussion by offering a completely different discursive rhythm.

The experiment is not over. *Silk Road* team members are unanimous in their desire to run the course again next year and to improve upon what was started here. Moreover, the lessons learned from Design Studies 4 and 6 are currently being applied through a second generation of custom courseware created for future Design Studies. When the School's new systems network (DMAN) is completed in 2000, the archives and tools developed for the virtual design studios will be available to develop the Networked Education in Design (NED) online for anyone anywhere any time.