

## Complex Designs: A Case Study on Sino-Norwegian Educational Cooperation using Digital Media

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This chapter contains introductory remarks on core characteristics of the knowledge economy and the framework this creates for new teaching and learning processes. The focus is directed at designs, design templates and design patterns. On the general level, e-learning is described as distributed discourse, and an important aspect of didactics is considered as the effort to design and engage participants in communications. Practical examples are provided from a multinational project spanning Norway, China, Italy and Poland with pupils and students on several educational levels.

### Backdrop: Digital Media in the Knowledge Economy

The historical rationale for large-scale manufacture was tangible but diminishing marginal costs. Over two centuries this effect gave rise to an industrial economy of mass. Opposed to this, the current knowledge economy has entire sectors where marginal costs are infinitesimal. Value that is put into the production process does not translate to or “rub off” on the singular end products but resides in the non-tangible aspect as *oeuvre* and *content*. This extends to singular design ideas and the composite of the activities to create new content and form. It also extends to the production processes as such and the required and renewed (and mostly digital) tools for their realization. In the words of Harvard economists Baldwin and Clark, 2005, design *is* the very means by which knowledge translates to economic and social goods in the knowledge economy. The development of new designs is itself an object of investigation and betterment, leading to more generalized *design patterns* and semi-finished (or under-designed) templates. They are deployed over a range of design challenges. On the macro-economic level one may consider this to be an example of economy of scope or the *reusability* principle. Briefly stated, societal value in the knowledge economy is a composite of repositories and representations of symbolic or textual content together with the tools and structures used for its production, maintenance, retrieval and dissemination. Value is primarily created as content, concept and design that may or may not embody the realization of more fluid design or concept patterns. A subset of this is commonly referred to as *media*, i.e. both as the container and delivery mechanism for textual content and content itself.

Digitization acts as the new and powerful lever that unifies, increases and remediates the volume of this intellectual capital, and by this token provides its defining impact in our times (Bush, 1945; Engelbart, 1962). Together with standardization of interfaces like the high- and low-voltage electrical grids for power transfer or the international container system for transfer of physical goods, digitization is a strong driver for globalization and internationalization. The hub-and-spoke (or center-periphery) type of social organization of the industrial age transforms into what Simon Phipps calls a “meshed world” (Moody, 2007), “future shock” (Toffler, 1970) or “supercomplexity” (Barnett, 2000). The latter terms are indicative of a certain mismatch in which human capital seems to trail the developments of

intellectual capital. This impacts media oriented institutions like publishing industries, schools and universities, as well as museums and libraries that deal with cultural duration and impartment (Altbach, 2002).

### E-Learning

On this general backdrop, educational environments actively explore the affordances provided by new media and the new economic and technological conditions. We consider formal learning as so many discourses where written and otherwise mediated expressions circulate between social agents (Blackmore, 1999). Related performances are seen as engagements within these *mediated circles of discourse* (see Figure 1) that contain expressive and impressive (or adaptive) elements. Participants take turns to appropriate symbolic content produced by others, but they also provide their own input. The latter may consist of mere reproductions or imitations. The reproduced texts may also be rephrased, augmented and extended, leading to either simple or extended textual reproduction.

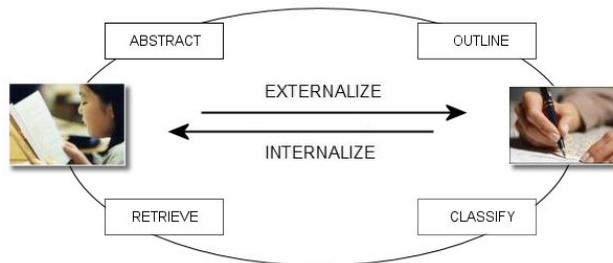


Figure 1: Circle of Discourse

E-learning designs may then be taken as so many efforts to rework, reinvent and expand upon an established set of media conventions when the mediated circle of discourse has education and learning as its purpose. We create new reading and writing spaces (Bolter, 1991). With these limitations, we will consider each learning design as one effort at digital remediation (Bolter & Grusin, 2000). Development of new designs draws upon previous modes of learning and must – to some extent – fit within the practices and requirements that circumscribe and relate to those modes but invents and expands upon them with the provisions of new media.

The parallelism and similarities of such efforts are yet another recent expression of globalization and, to some extent, a movement toward monoculturation. A comparative study of ICT dissemination in Norway and China found, for instance, marked similarities in their implementation of digital learning environments between two different cultures of higher learning (Høivik and Cui, 2006). Norway is a small, wealthy, modernized society that generally shares with Western Europe an insistence on individualism and a pedagogical tradition with a strong bent towards social constructivism and collectivism. China is a rapidly modernizing, collectively oriented society that exhibits a new-found insistence on individual development combined with deep-rooted Confucian learning traditions. Despite these and several other differences, the study found strong parallel developments between the newly

established and agile Oslo University College and one heavy-weight of the Chinese academic sector, Peking University. They are orchestrated by the convergence of how digital texts are produced, distributed and “consumed.” Even though each approach was developed locally and without any direct link between them, the conceptual solutions and their tools for development and implementation were derived from the same global design space.

The similarity between them did not end with development and implementation strategies. Even more so, there are similarities in the general outcomes – or rather: the lack of broad results. In both China and Norway, as in most other countries, investments in digital educational technology have met with less success than anticipated. A certain mismatch between new technological opportunities and the required social capability is obvious.

An Organization for Economic Co-operation and Development (OECD) report from 2006 based on a set of recent global surveys may serve as an index. The authors point to the proliferation of networked computational infrastructures, but also to the concurrent lack of pedagogical uptake when they write that:

Although the multiplication of platforms typically shows the novelty and relative immaturity of LMS [Learning Management Systems], it might also represent a wasteful duplication of effort ... and correspond to an over-emphasis on the technological infrastructure when the real challenge could lie in the innovative and effective use of the functionalities offered to faculty and students. The pedagogic impact and institutional take-up of new and prominent open source platforms ... remain unclear. (OECD, 2006, p. 15)

To rectify this, the report presents broad recommendations like the dissemination of good practices to stimulate innovation and scale up successful experiments. Staff development on the individual and collective levels should be supported as well as R&D efforts related to learning objects and other promising pedagogic innovations. Having worked with educational innovations in new media for the last three decades, we share this view. The weight should still lie on the development of good practices from grounded experiments that provide *proof of concept* rather than *evidence* of wide-spread effect. We furthermore subscribe to the notions of the London-based Kaleidoscope research network when they write that:

Traditionally, formal education has focused more on the transmission of stable knowledge established by scholars and scientists. But education is now recognizing the importance of equipping individuals with the capability to produce their own knowledge – to continue to learn from their own experience and interactions with others. The skills of enquiry, analysis, synthesis, collaboration, knowledge negotiation, evaluation, communication, are the high level cognitive skills that we all need as citizens and as a workforce. Technology supports both expert and practitioner knowledge. It can support the teaching of stable knowledge, as in tutoring systems, or in computer-supported inquiry-based learning. And complementing this, a key theme in Kaleidoscope is research that focuses on supporting the development of ‘practitioner knowledge’ through interactive and collaborative online environments in which users can create and negotiate new ideas or representations of their practice. (Laurillard, 2006, p. 4)

In this chapter, we present experiences from one exploratory project toward such knowledge construction and negotiation. We give a brief overview of the project design on a more general level before we present two subprojects in more detail.

### Versatility

A project is commonly understood as a temporary endeavor undertaken to create a unique product or service. But our approach here is more akin to the principles inherent in agile development (Cockburn, 2001). In relation to the founding manifesto of this approach we emphasize continuous and incremental product improvement, quick turn-around and continuous design and design improvement of product, tool and production process. More importantly, agile development is not a method *per se*, but more an attitude or general approach. Agile development is phenomenological rather than structural. Paul Dourish deals with interface design in this perspective when he writes that:

... phenomenology turns our attention to how we encounter the world as meaningful through our active and engaged participation in it [where] the approach to interface design allows us to engage with technology in ways that allow us to uncover, explore and develop the meaning of [its] use as it is incorporated into practice. (Dourish, 2001, p. 11)

Figure 2 below may illustrate our approach. Within a more general and long-term stream of events, the three arrows represent the innovative project in the common interpretation of this term, but on a small scale. Each arrow has some merit, but it is the accumulation of experiences across these activities that generate new insights and design ideas.

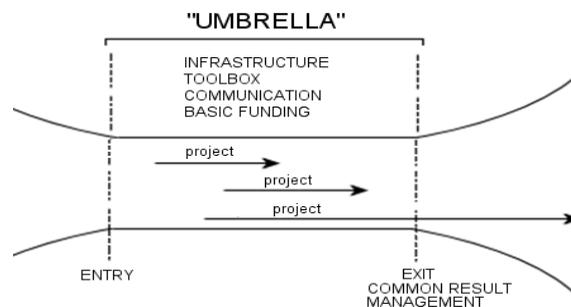


Figure 2: Umbrella Project Model

Each arrow is defined in relation to a particular field of practice and its agents and agencies. Here we identify the social roles of *end user*, *representative* (of the field), *developer*, *project leader* and *supervisor*. The developer creates e-learning solutions to cater to end user needs. The project leader, who might wear the hat of developer as well, coordinates and drives the process of requirement specification, development, implementation and testing/evaluation. He or she can only do so in close cooperation with the representative

and the end users of the field. In this way, each subproject represents one singular effort to develop a context-dependent solution to an e-learning challenge. The time frame for any one of the subprojects may be a few months and up to 1-2 years.

Teachers in higher education will recognize this approach as a *didactic* design for learning-by-doing. This is precisely how the work has been framed, financed and developed.

The elements *infrastructure*, *toolbox* and *communication* in Figure 2 were established by us to create and conduct one particular university course. This Master's Degree offering 15 European Credit Points (equal to ¼ of an academic year) was conducted in the blended mode and as the core around which other activities would flow and be initiated. For the subprojects we had initially identified the areas of arts and crafts as well as health care, but we also left space for the participants to further refine or redefine this. Individual and groups of participants were thus invited to expand upon or redefine the topics for the smaller developmental projects.

Funding came primarily from Norway Opening Universities (NOU) which is a governmental body with the particular responsibility of promoting e-learning through experimental work.

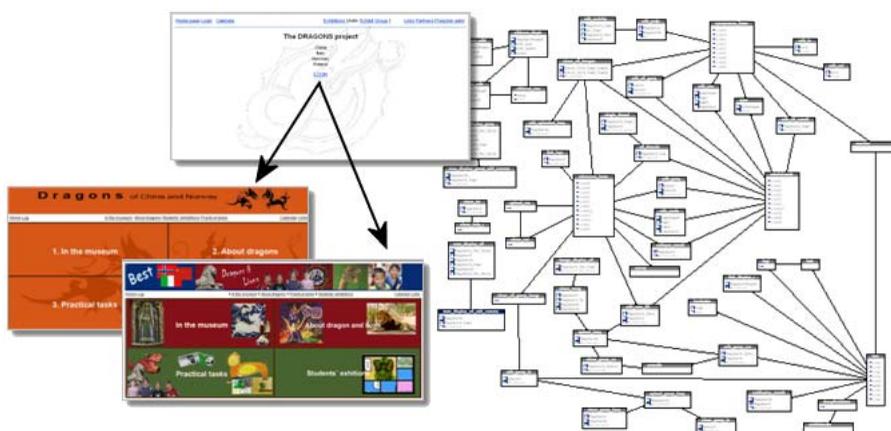


Figure 3: Template and Two Implementations - The Dragon Projects

Figure 3 illustrates one core element of the approach where a design pattern is used to build templates that spawn instantiations. Based on the Fragments general design pattern (Høivik, 2005) we built a template for the “Dragon” projects. Two copies drawn from this setup were enhanced and modified by the developer/project leader and the authors for two different, but related purposes. Both should act as intermediaries – or boundary objects – for cooperation between Chinese, Norwegian and Italian school children to display and negotiate their concept of the dragon as a mythological figure.

## Globalized Infrastructures - Shared Tools

Social computing is a socially and technically complex and multi-modal practice. Of prime importance is the shared infrastructure which is composed of information and communication technologies with related protocols, interface conventions and design patterns. This enables mash-ups where users combine or reuse computational components into an integrated experience.

Figure 4 shows the common client-server architecture that was used. It consists of a standard LAMP/WAMP stack with Linux or Windows as the operating system, Apache web server, PHP (or Python or Perl) programming language and a MySQL database server. The client side is run through an Internet browser. There is also a dedicated database (in this case the defunct *MySQL-Front*) client for maintenance access to the repository.

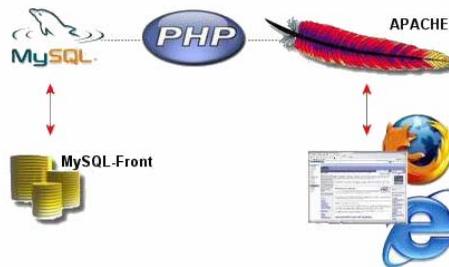


Figure 4: LAMP / WAMP Stack

WEB 2.0 would not exist without such shared tools and the related shared competencies. The last point is not the least important. The extensive knowledge distribution through Internet postings of advice and code has established one new collective *persona*, - a *Friendly Other*. He and she are found by the thousands in China, India, Europe, the U.S. and elsewhere. Each individual behind this emerging social archetype provides countless others with advice, code snippets and opinions. They represent one aspect of the deeper sociality in social computing.

This process of collective learning within on-line communities of practice is evident on the infrastructure level and as regards particular protocols, programming languages, tools and the commercial or open-source products. Such resources have served both as direct inputs to the present work and as the referential or defining ecology for its design. The following provides a few examples.

## Contextually Derived Software Solutions

To serve the particular needs that arose in our work we developed a handful of small-scale and experimental software solutions. Some are general and classify as infrastructure. Others were tailor-made for each project. Most of the latter types were dedicated to the two “Dragons” projects. As one example of the former we will take a brief look at a collaborative presentation tool. It supports creation and the use of on-line presentations in multiple

languages across the Internet and was developed and used for lecturing purposes in our MA course.

Figure 5 presents the main interface elements of the player.

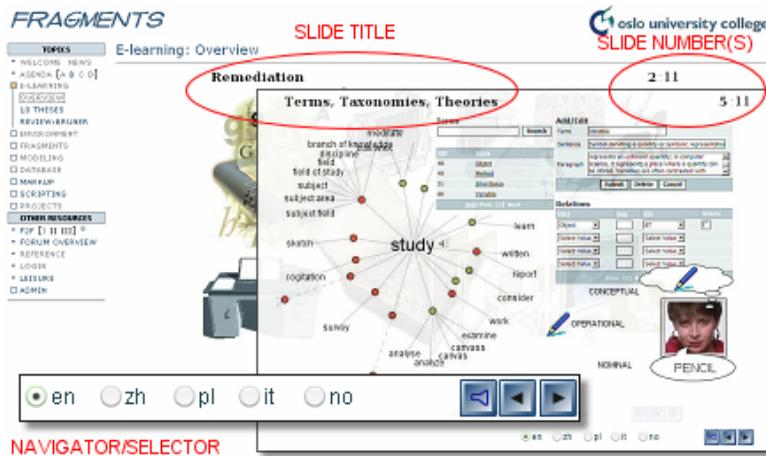


Figure 5: Presentation Tool

In the background is shown an instance of the player as it is integrated with other content in a single browser screen. Another instance is overlaid showing the player only with an enlarged navigation bar up front. The bar contains simple buttons for moving backward and forward in a linked list of slides. The radio buttons are marked with the two-letter codes *en*, *zh*, *pl*, *it* and *no* for *English*, *zhōng* (Chinese), *polski*, *italiano* and *norsk* (Norwegian), respectively. By selecting the relevant language and pushing the sound icon, a sound file in MP3 format is played. It is commonly used for oral lectures and comments.

The figure shows two slides. A single lecture consists of arbitrarily many. They are stored as still images and Flash movies on a WEB server together with several corresponding MP3 sound tracks. The MySQL database contains one table with name, addressing information and a description of each slide. An additional table describes the ordered sets that constitute each slide sequence for a lecture.

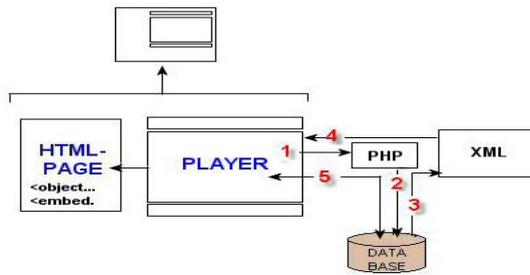


Figure 6: Logical Diagram for the Data Flow for the Presentation Tool

Figure 6 shows the data stream feeding the player (written as a Macromedia Flash movie). It is embedded in an HTML page and requires one single parameter that identifies each ordered set that corresponds to a particular lecture. This value is fetched by the player from the HTML <OBJECT> or <EMBED> set of parameters. The player then issues a database call in PHP syntax to the database with this value as the selection criterion (1 + 2). The selected data are formatted as an XML stream that is read by the player (3 + 4) so that the address for each slide is extracted from an XML child node and the corresponding slide fetched from the database.

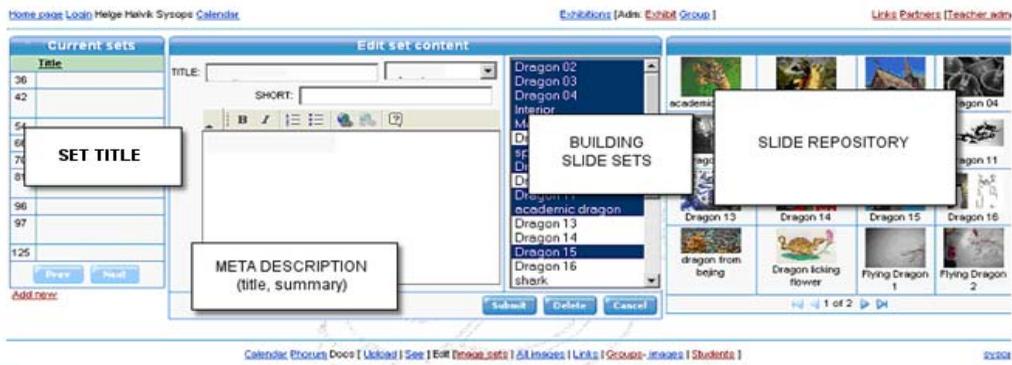


Figure 7: Ordering Lists Stills, Video and Animations for Display Purposes

As an example of the latter we use a function for ordering online animations within the two “Dragons” projects. There was here a need to reorder still images, video footage and short animations for small online exhibitions. Using a mixture of online available scripts and fresh programming, we made two solutions. The first allows the user to define image sequences, describe them and select or deselect their contained items as shown in Figure 7.

An additional WYSIWYG (What You See Is What You Get) solution was also built based on freely available scripts. Using point-and-drag techniques, the user may move images between positions in a 4 by 4 framework as shown in Figure 8.



Figure 8: Two-dimensional Drag-and-drop Reordering  
Umbrella and Subprojects

In the umbrella model in Figure 2, the provision for entry and exit management coincided with recruitment and formal exams in the MD course for participating students. Each individual project was a term assignment where students were required to put into practice what they had learnt in class and with one essential requirement: Projects should relate to and be disseminated to real fields of practice and preferably in a manner that would link these across national and cultural borders as well as between educational levels. The overall aim of this work was thus not to establish and run MD courses as such, but to explore design ideas and practices as described in the opening pages of this chapter. A main aim was

..the development of ‘practitioner knowledge’ through interactive and collaborative online environments in which users can create and negotiate new ideas or representations of their practice. (Laurillard, 2006, p. 4)

The undertaking was given funding for this purpose under the formal title “Academic Network Building Through User Development of E-Learning Solutions.” Table 1 illustrates the results of this approach where 6 individual subprojects were developed by a total of 10 developers. As is sometimes the case, not all projects came to fruition. This happened with a well-conceived effort to create an interactive repository for so-called “step sheets” which is a mechanism to provide individualized learning at various “steps” in Norwegian primary schools. One way or the other, the remaining five projects were developed and tested. One of them called *Visual Semantics* was a solution for collaborative work and comparative analysis of visual creativity among Norwegian and Polish pupils. Parts of the basic work were integrated into what turned out to be a successful doctoral dissertation in Poland. One other (*Learning Path*) was directed at Norwegian participants in a Bachelor level course in physiology in nursing as the defining field of practice.

It may seem too *nitty-gritty*, but a little more of the organizational detail deserves attention for illustrative purposes: One participant who worked on the three projects *Dragons & Lions*, *2006 Best Architecture* and *Visual semantics* did this as part of her doctoral-level qualification. A Chinese and a Polish participant – both MA students – joined her on the first of these, while one Polish student took part in the last. A Norwegian student was formally assigned one project alone, but received substantial support to shoulder this task.

Table 1. Umbrella with Individual Projects

Sub Projects	Dragons of China & Norway	Dragons & Lions	2006 Best Architecture	Visual Semantics	Learning Path	Step Sheets	Total
#executives	1	3	2	2	2	3	10
Level	MD	MDPhD	MD	PhD	MDx2	MDx3	
Nationality	N	Ch N	P	N	N N	N N N	
Gender	F	F F	F	F	M M	F M M	
#participants	51	152	192	100	40	N/A	535
BA stud N		60			40		100
N	28	21	54	50			153
Ch	23	20	12				55
P			35	50			85
I		51	91				142

N=Norway Ch=China P=Poland I=Italy M=Male F=Female Note: Participant numbers are estimates based on the earlier and middle stages of each project. They might be different at the end of the project.

These are practical examples of complexity handling and border crossing, or – subsumed by one single term – as *versatility*. A common framework and design pattern is employed across several practical – and differing – implementations. This represents a practical and small-scale example of economy of scope.

We propose that such versatility should be taken as a candidate characteristic of successful e-learning. We furthermore relate this to the concept of *boundary objects* (Star & Griesemer, 1989). They are physical or cultural artifacts that are shared by different contexts. By that token they can also act as interfaces between them. A boundary object is handled and talked about in different ways by different communities. But since they are also shared, they may serve to expand and integrate two or more cultural contexts. This was precisely how we defined the initial purpose of our collaborations.

The Sino-Norwegian educational cooperation that we report on here as part of the overall work was thus primarily aimed at strengthened cooperation using digital media as the integrating boundary object. In the following we will look closer at the two “Dragons” projects that realized this ambition.

#### In More Detail: The Dragons Projects

The particular subproject we report on here was anchored in the institutional practices of the partners – in our case Beijing Normal University and Oslo University College with extension to partner schools in Bergamo and Roma in Italy as well as the National Museum of Art, Design and Architecture in Oslo and the Cultural Center of the Li (Lai) minority in Whuzhishan in the Hainan Province, China. The choice of dragons as a leitmotif grew out of

the previous and unrelated engagements through which we entertained a relationship with this cultural center in Whuzhishan. Since the dragon image is an engraved concept also in Norwegian culture, it made a good fit that this center had in its possession an ancient and very valuable dragon carpet. One impression and one idea begot the next and we ended up with this as a *cultural* boundary object.

The work relates to the time-frame 2004-2007 when initiatives were taken – and funds provided – in the fall of 2004. Preparatory work and consortium or network building was conducted through the first half of 2005. The dragon theme was initially identified as common to all participating countries and taken to be a mutually recognized but also as diverse lever for interaction and enhanced understanding between participants. We then became aware that this was not true for Italian partners where folklore is not strong in this respect. The project was thus extended to cover the image of lions which reestablished common ground between all four countries.

In each country small groups of pupils were invited – and in some cases trained – to describe their concept of dragons (and lions as the case was), exchange these materials through a software application and – in various degrees – comment and otherwise communicate between each other on these contributions. In the project “Dragons of Norway and China” this was done along institutional lines so that each group comprised pupils at one school only. In the parallel “Dragons and Lions” project the opposite approach was taken with multinational teams. Each (virtual) group drew members from each of the three countries.

Each team produced and uploaded singular images or videos/animations about their topic. In the first project the teams generally sent one still image and one animation, while the pupils in the second sent an average of 15 stills from each group (of which some were duplicates or false uploads). They also wrote a few words about themselves and their topic and gave brief feedback to each others’ presentations. Up to 19 written messages were recorded for the uploaded material with a preference for the animations that fetched an average of 7.5 short messages each.

#### Participation Data

Close to 100 pupils participated in the Dragon projects. They were mostly in their teens and mostly girls (3 out of 4). One school in China (Beijing) and one in Norway (Oslo) differed to some extent from this profile in that the pupils there were younger (10-11 years) and with a greater proportion of boys (2 out of 5).

Between the schools there are also other systematic differences in these populations in terms of school size, infrastructure, local tradition and history, selection criteria, etc. The Beijing school was chosen as one with longstanding engagement with computerized learning as was the case with the Valdres and Oslo schools in Norway. In Sanya the participants were among the “elite” students with a good grasp of English. They study at a mixed school based on tuition and non-tuition contracts for both boarding and non-boarding pupils. Project work at the three Norwegian schools was handled by two Norwegian MD students assisted by their advisors. The Chinese part of the project was initiated by us and handled by one Norwegian and one Chinese MD student respectively. The pupils in two of the Norwegian schools conducted excursions to study the dragon theme. The first made a modest trip within the vicinity of their school while the other was invited for a special program at the Norwegian

National Museum of Art, Architecture and Design in Oslo, including lectures and exhibitions of Chinese folk art from Hainan that was paid for by project funds.

Table 2. Participation Norway, Italy and China

Counties & Cities	F	M	T
<b>NORWAY</b>	<b>74</b>	<b>33</b>	<b>107</b>
Valdres	11	2	13
Mysen	13	0	13
Oslo	50	31	81
<b>Italy</b>	<b>20</b>	<b>15</b>	<b>35</b>
Bergamo	20	15	35
<b>CHINA</b>	<b>30</b>	<b>13</b>	<b>43</b>
Beijing	12	9	21
Sanya	18	4	22
<b>Total</b>	<b>124</b>	<b>61</b>	<b>150</b>

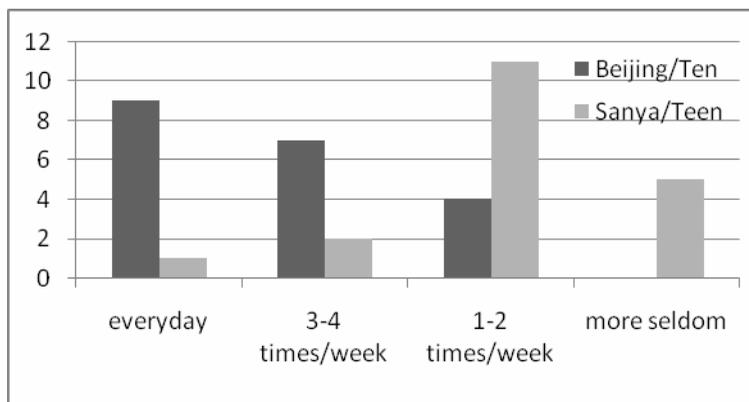
More important than these differences on background variables, the methodological approach to describe and analyze the work was generally ad-hoc and experiential with an eclectic mix of participatory observation, analysis of online contributions, conversations and semi-structured interviews. To counteract this lack of formality we conducted a follow-up survey of the Chinese participants. A similar after-the-fact investigation in Norway proved unsuccessful. For these and other reasons, the project must be considered exploratory rather than comparative. But as such it provides some insights and experiences.

The following brief discussion is based on the available empirical material. It consists of the thesis for the Master Degree by the leader of one of the subprojects that deals with Mysen, Valdres and Sanya (Bergum, 2007). Added to this is quantitative data available as recorded on the project website as well as our survey of the Chinese students that we conducted in Sanya ourselves and with the help of the Chinese MD student in Beijing. This is a brief walk-through, though, where we look at computerization levels and competencies, the students' objective contributions and their subjective appreciation of this kind of learning process.

### Computerization

Data on the computerization levels is not available for all participating schools in Norway and China. We circumvent this by using general statistics in Norway, which to a large extent is mirrored at the school level, with the factual data extracted from our interviews in China.

The yearly national survey in the Norwegian “ITU Monitor” shows marked differences in computer use in primary and secondary schools in that country, but also that the gap is diminishing (ITU 2007). Teenagers generally use computers on a daily or almost daily basis while the frequency is less at lower grade levels. ICT is mostly used by Norwegian pupils for searching the Internet to find information and to integrate this with previous knowledge and as a tool to produce text and numbers in office productivity applications. Based on the survey data we find that the pupils in the Beijing school use computers in a similar manner. Their older counterparts in the south are not as frequent users and less so than the Norwegian pupils as shown above.



Note: Pupils at the Beijing school are mostly 10 years of age while those in Sanya are in their teens.

Figure 9: Frequency of Computer Usage

Overall the usage patterns are quite similar between the two countries. The teenagers in our survey use the Internet to search and browse the Internet as do the Norwegian students.

As could be expected, the younger Beijing pupils use Internet-related functions to a lesser degree, but are relatively more occupied with locally hosted software like word processing, drawing programs and games. The latter fact may reflect their character as a “computerized school.” In Beijing 4 out of 5 of the youngsters have a home computer while only 1 out of 3 did so in Sanya. Most of these computers (2/3) were without Internet connection. Where relevant the Sanya pupils did compensate with visits to Internet Cafés, but not so in Beijing. This may be explained by age differentials or the government-imposed age restrictions on café usage.

The overall pattern that emerges from Norwegian national statistics and these numbers is one of similarity. It seems that both countries are now engaged within the same educational “design space.” Even though each country and each school or region in the economically developed parts may show differences, they are generally quite similar with respect to the general trait of computerization. We may conclude with reasonable safety that it is viable to conduct online cooperation at most school levels – at least in the more affluent institutions – in terms of computer access and general competencies.

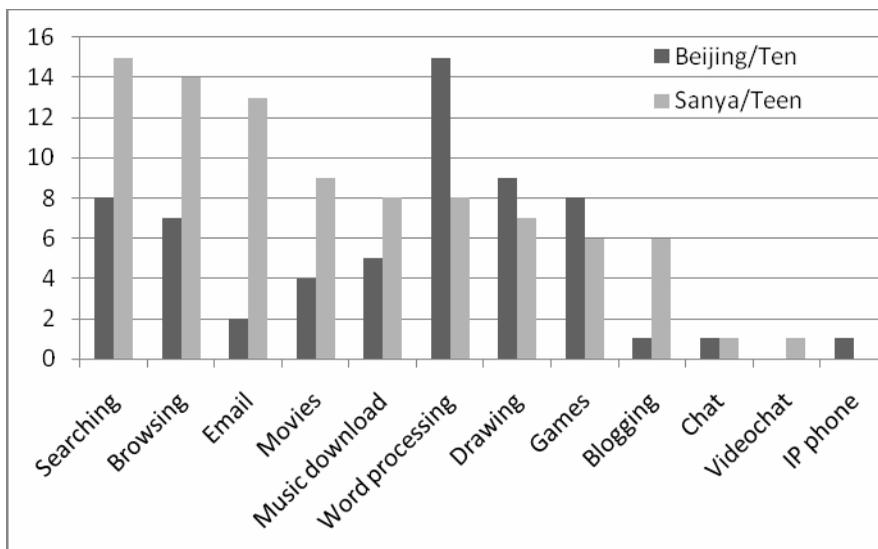


Figure 10: Usage patterns by 10-year-olds in Beijing and the teenagers

### Pupils' Experiences

Between them the pupils produced close to 20 animations with the dragon theme and uploaded them to the common website. They also wrote close to 90 messages to each other about their work. Based on conversations and interviews Bergum (p. 96-99) found that the Norwegian students did enjoy the work and found it stimulating to create and discuss these animations. But they did not feel that they learnt so much about the topic itself (i.e. the dragon as a common, but very different mythical creature in the two cultures). This changed somewhat when the students took part in the event at the Norwegian National Museum.

The Chinese students were likewise asked to what extent they agreed or disagreed with this question: *Do you think that this practical project was helpful in your studies?*

Compared to the Norwegian pupils, the Chinese pupils felt more strongly that they had learnt something new about the two cultures through this project.

The Chinese pupils also felt that the mode of working in project groups as they did in this project was of value – and more so in the South.

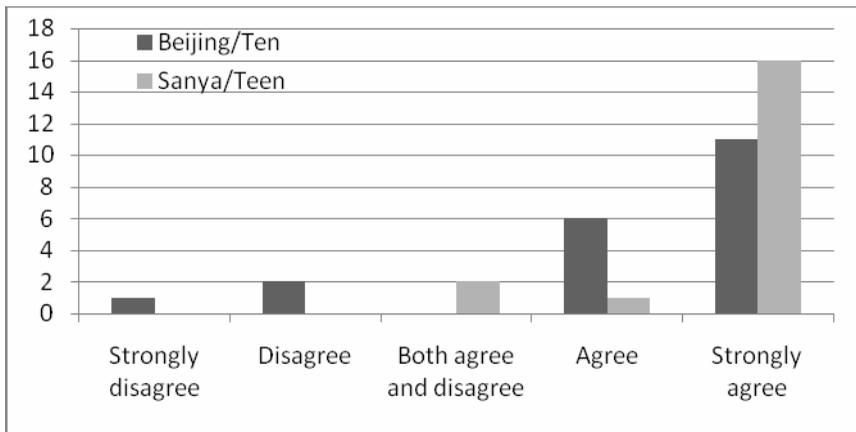


Figure 11: Level of agreement with the statement: “Do you think that this practical project was helpful in your studies?”

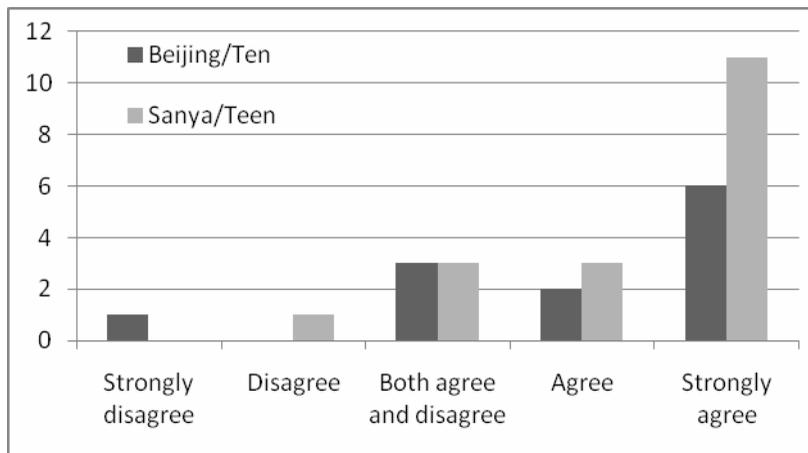


Figure 12: Level of agreement with the statement: “Have you learnt something about the dragon as cultural object in other countries?”

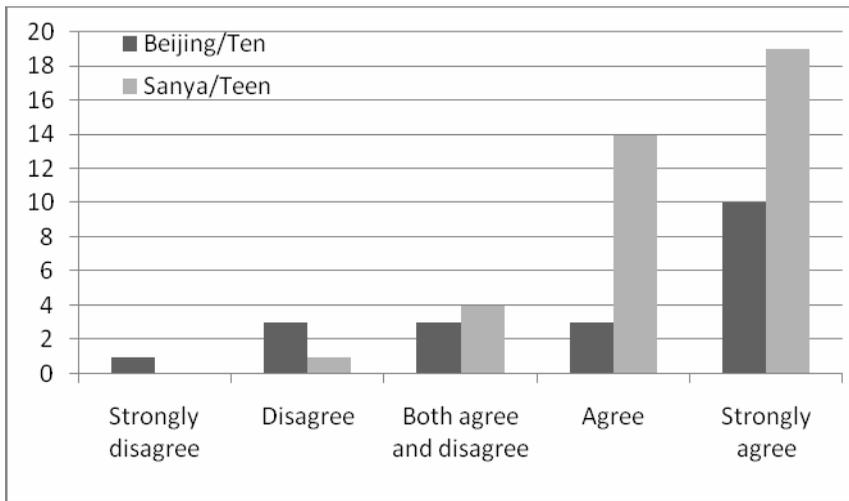


Figure 13: Level of agreement with the statement: “This project taught me something valuable about cooperation between pupils.”

### Summary and Conclusion

In this chapter we set out with an emphasis on design, design patterns and new concept formation as main activities within the knowledge economy. In this framework education is increasingly about the construction and application of collaborative online environments where students and pupils access, create and negotiate both old and new concepts and representations of relevant practices.

We have looked at one example that we describe as a versatile effort in this direction. This is demonstrated by the complexity of the social and organizational constructs and relationships that were necessary for its realization. It was by design - not by chance - that this work thus exemplifies a “meshed” approach combining students and pupils at several levels of the educational system (primary school, secondary school, MA and PhD levels) from different countries (Norway, China, Italy) and institution types (institutions of higher and lower learning, museums and cultural centers). Most e-learning efforts will not show similar levels of complexity, but may well approach – and in rare cases – transcend this limit.

From a scientific point of view, such experiments lend themselves to formal research. But this may come at the cost of the educational effect. If, on the other hand, we allow a degree of eclecticism and welcome smaller projects as idea generators and pilot studies, one stands to gain at all levels. As such, we also consider this work a successful experiment to give new meaning to the concept of research-based education – or rather a reformulation of this ideal: the integration of education with research and development efforts in a digitized economy.

## References

- Altbach, P. (2002, summer). Perspectives on internationalising higher education. *International Higher Education*, 2-5.
- Atkins, D. E., Seely Brown, J., & Hammond, A. (2007). *A review of the Open Educational Resources (OER) movement: Achievements, challenges and new opportunities. Report to The William and Flora Hewlett Foundation*. The William and Flora Hewlett Foundation.
- Baldwin, C. Y., & Clark, K. B. (2005). Designs and design architecture: The missing link between “knowledge” and the “economy.” *Harvard NOM Working Paper 1*.
- Barnett, R. (2000). Realizing the University in an age of supercomplexity. In M. Keynes (Ed.), *Society for research into higher education*. Open University Press.
- Blackmore, S. (1999). *The meme machine*. Oxford: Oxford University Press.
- Bergum, I. L. (2007). *Nettbasert formidling mellom museer og skole i Norge og Kina – DRAGONS of China and Norway* [Internet-based dissemination between museums and schools in Norway and China – Dragons of China and Norway]. Master program in design, art and craftsmanship. Faculty of Art, Design and Drama, Oslo University College, 2007.
- Blin, F., & Munro, M. (2007). Why hasn't technology disrupted academics' teaching practices: Understanding resistance to change through the lens of activity theory. *Development, disruption & debate: Abstract book, Volume C*. Oxford: Elsevier.
- Bolter, J. D. (1991). *Writing space*. Hillsdale, NJ: Lawrence Erlbaum.
- Bolter, J. D., & Grusin, R. (2000). *Remediation: Understanding new media*. Cambridge: The MIT Press.
- Bush, V. (1945). As we may think. *The Atlantic Monthly*, July 1945.
- Cockburn, A. E. (2001). *Manifesto for Agile Software Development*. Retrieved May 19, 2007, from: <http://agilemanifesto.org/>
- Dourish, P. (2001). Seeking a foundation for context-aware computing. *Human-Computer Interaction*, 16(2), 229-241.
- Engelbart, D. (1962). *Augmenting human intellect: A conceptual framework*. Stanford Research Institute.
- Hoidn, S., & Gilbert, D. (2007). *Teaching and learning in Wallenberg Hall's experimental classrooms*. Retrieved May 22, 2007, from: [http://www.elearningeuropa.info/directory/index.php?page=doc&doc\\_id=9541&doclng=6](http://www.elearningeuropa.info/directory/index.php?page=doc&doc_id=9541&doclng=6)
- Høivik, H. (2005). Grounded development of a learning design pattern. In R. Koper, C. Tattersall and D. Burgos (Eds.), *Current research on IMS learning design*. Proceedings of the UNFOLD-PROLEARN Joint Workshop Sept. 22-23, 2005.
- Høivik, H., & Cui, G. (2006). A great equaliser: E-learning patterns in Europe and Asia. *Proceedings of E-learn 2006*. Chesapeake: Association for the Advancement of Computing in Education.

- ITU - Forsknings- og kompetansenettverk for IT i utdanning: ITU MONITOR 2007 [Research and competence network for IT and education: ITU MONITOR 2007]. *Skolens digitale tilstand* [The digital situation in schools]. *University of Oslo*. 2007.
- Laurillard, D. et. al. (2007). Kaleidoscope Scientific Vision Statement, vers. 1.0 March 2007; ©2007 Kaleidoscope Network EU contract 507838. Retrieved January 25, 2008 from: [http://www.noe-kaleidoscope.org/public/pub/lastnews/images/kal\\_vision.pdf](http://www.noe-kaleidoscope.org/public/pub/lastnews/images/kal_vision.pdf)
- Moody, G. (2007). Interview with Simon Phipps. *Linux Journal*, 158, 46-49.
- OECD. (2006). *E-learning in tertiary education: Where do we stand?* Paris: OECD.
- O'Toole, R. (2007). Transversality. The conceptual failure of higher education policy, part one: Quality assurance and taxonomization. Retrieved May 18, 2007, from: [http://blogs.warwick.ac.uk/rbotoole/entry/the\\_conceptual\\_failure/](http://blogs.warwick.ac.uk/rbotoole/entry/the_conceptual_failure/)
- Star, L. S., & Griesemer, J. R. (1989). Institutional ecology, "translations" and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19, 387-420.
- Toffler, A. (1970). *Future shock*. New York: Random House.