Visualization, Linguistic Multiplicity and Semantic Annotation as Didactical Scaffolds for Internationalized e-Learning

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Introduction: Reflective practice

Helge Høivik

Since the 1990's the Internet and related technologies have developed at an astonishing rate. The impact is strongly felt in most areas of symbolic work within the traditional industrial paradigm and the new knowledge economy. Digitalization at the turn of the 21st century may thus be conceptualized as global retooling and restructuring of the economy.

As an extension of this, digitalization impacts the educational field. Changes in knowledge domains like genetics or **astronomy** and changes in professional fields like health care or law entail new educational needs among those who earn their living there as well as their clients. New developments within the educational institution as such also contribute as changes in the ways in which research; teaching and learning are performed in their own right.

50 years from now writers may well look back at this historical junction and present authoritative accounts of what took place. But today we are agents and sometimes victims of these changes. We cannot aspire to reach final conclusions.

> *When philosophy paints its grey in grey, one form of life has become old, and by means of grey it cannot be rejuvenated, but only known. The owl of Minerva, takes its flight only when the shades of night are gathering.*
>
> (Hegel 1897)

A research paradigm of detached observation is thus largely bound to fail. This is also why current efforts to measure the educational impact of new technologies are often misunderstood.

I believe that a methodology of reflective practice is more appropriate. This is not because such approaches are more valid than traditional research. Validity is a relational concept. It must have an external point of reference as when "better educated" is understood in relationship to particular tasks, contexts and cultures. To put this differently: In times of rapid change we need to engage in a double movement of research and development where the latter plays a pivotal role. We use development techniques and reflection upon results to establish new points of reference.

In this context reflective practice offers two self-evident advantages:

- Reflective practice in the digital field is doing. It is agency. The practice part is a conscious and disciplined engagement in furthering the digitalization process.
- Reflective practice in the digital field is consideration. The reflective part is the disciplined effort to develop vocabulary and concepts that may faithfully and productively give name to and convey meaning to others about newly experienced phenomena and newly developed artefacts.

But there is a caveat. The reflective practitioner engages with new and unfinished tools against new and unfinished materials, processes and structures. Time tends therefore to be a particularly scarce resource.

In classic academia the researcher spends much effort to identify, evaluate and absorb texts written by others. Practitioners struggle with development and implementation problems and the avalanche of daily trivia. In both approaches one need to identify, observe, collect, ponder and write. But the traditional researcher is at an advantage. She gravitates towards one single dimension of texts. The field is construed from texts by others and texts by oneself with interrupts of common discourse about them and an important, but subordinate input of fresh data. Since the reflective practitioner is expected to perform at the same level of textual sophistication, she has a double obligation. She must do it *and* write about it. To address this imbalance, one should adjust evaluation criteria. R&D should be doubly reviewed by merit of analytical thought and by merit of practical impact.

The current papers are written as expressions of the logic of the D in R&D. They convey practical experiences and they document small, but visible educational changes.

They were presented at a seminar on visualization and vocabularies as pedagogical tools that took place at Oslo University College in September 2005.

Most participants at this event came from a career-track programme for college lecturers at Oslo University College. Others were guests and colleagues from other institutions of higher learning in Norway, Poland and China.

The material is presented as work-in-progress in the "notes" series that is published by Oslo University College. Comments and criticism are very welcome.

Oslo February 6th 2006
Helge Høivik

The ICON Approach to E-learning

Helge Høivik

Background

Since the late 1990ies the Centre for Educational Research and Development at Oslo University College has been engaged in two distinct stages of development to support and spearhead e learning. Focus was initially on building basic digital competencies within the academic staff. The aim for this period lasting from 1998 to 2002 was to enable participants *to adequately express oneself* (in the digital field) *as a professional and as a professional educator*.

We are now in a second phase. In line with the current emphasis on "social computing" some of our work is now more concerned with *building educationally relevant networks*. The means to achieve this objective is defined in relationship to WEB 2.0 technologies as *end-user development of e-learning solution*.

In order to support this objective we have developed and deployed a training course called *Fragments*. The course was initially part of a programme for a Ph.D. level qualification that is run by the centre. This program is more oriented to development work than a classical doctorate and it is loosely inspired by the traditions of grounded theory, action research and reflective practice.

The purpose of this particular course was to provide tools, know-how and the analytical and organizational ability to build e-learning artefacts. The name *Fragments* derives from the many semi-finished routines and functions that participants learn to make and use that they then stitch together to form workable solutions. But this is not an end in itself, but means to support participants' specific educational needs for e-learning solutions and for network building in that context.

After two runs, the course was redesigned, translated to English and also offered internationally to students who sought a Masters Degree in Learning and ICT.

Experiences from these three years of work have led to rules-of-thumb that I have called the *ICON approach*. This acronym is an abbreviation of *Integration of the Conceptual, Operational and Nominal*. The current paper is a first effort to present this conceptualization.

ICON: Three Facets for Two Domains

The ICON approach is applicable to two semi-separate domains. The first is made up of the topic to be taught. The second relates to the way one teaches this topic, - the didactics, logistics and the organizational dimensions of a given educational offer. I will initially give a brief comment to each of the three facets represented by the three letters C, O and N.

C for Conceptual

> The *conceptual level* deals with conceptual underpinnings; with ideas, notions and perspectives.

This may seem self-evident when it relates to a particular subject area in traditional academia. History, mathematics and sociology are conceived as well-defined domains of knowledge. This is not so evident in new and emerging fields. Here we will often find that it is the requirements for professional training as they developed over time that defines the domain. In professional educational programs like librarianship, nursing etc. one has problems when one tries to discern the unifying concepts.

One rule-of-thumb in the ICON approach is therefore the requirement to clarify topical ideas. I relate this to two ways of understanding the concept (or metaphor) of *field of knowledge* itself.

A field may be discrete as in a field of daisies. It is not hard to list criteria or find the border where one may say: this is inside the field and that is outside. A field may also be continuous with a core and a progressively weakened fringe as in electro-magnetic fields or fields of vision. In this case the field is defined by an organizing principle like the influence of a particular extending force or by the physical and neurological characteristics of (visual) perception. It is not so easy to detect clear-cut borders here, but we may easily identify stronger and weaker areas of field impact.

One problem with professional fields of study like librarianship and nursing is that they tend to be defined in line with the first field concept, i.e. as given by institutional and behaviouristic borders. Whatever takes place within a library or a hospital as performed by librarians or nurses are part of library or nursing sciences. This might appear as a good guide of R&D initiatives in quiet times. But research becomes unfocused when digitalization challenges professional behaviour so that the professional border is blurred and essential tasks undergo changes.

As a consequence, e-learning courses in higher education should explicate their conceptual underpinnings. In some cases a course may be explicitly weak in this respect. The aim is rather to

train participants to execute current techniques and behaviours within a given profession. One should classify this kind of courses in two groups depending on the impact of digitalization. If we use computers to perform these operations, then e-learning approaches may be useful and even mandatory. If not, computers may have little value as educational tools.

In other cases the course aspires to convey the conceptual essence of a knowledge domain. If so, it may be appropriate with e-learning solutions that highlight conceptual and linguistic aspects.

The conceptual level embraces also didactics and organization: Why a course is organized and conducted as it is. Examples may be the expected behaviour and roles that are created for enactment between students and teachers, between student peers and between students and fields of practice. This relates to communication structures and media types and how they play together to present, document and create discourse in the collaborative learning processes.

O for Operational

> *The operational* level deals with how the conceptual underpinnings are carried out in practice - how they manifest themselves in time and space.

Here we consider activity spaces of the Euclidian kind, but also network- and computer-generated social (virtual) spaces. Within those spaces we are concerned with ongoing practices in relationship to significant (*relevant*) others – and with particular emphasise on tools and infrastructure that supports specific and generalized learning.

It is worth to remember that the operational dimension is very much alive in both the topical and the didactical domain, say in occupational therapy and mathematics. The teaching/learning of mathematics and the operational "execution" of mathematics may lie closer to each other than to learn about and to execute therapies. The e-learning designer and teacher should nevertheless distinguish between the two facets so as to make clear in what way the course structure prepares (or do not prepare) for future professional endeavours.

N for Nominal

> *The nominal level* concerns linguistic constructs and the forms of communication involved in teaching and learning.

Here we direct our attention to how teachers, students and others write, talk and otherwise express themselves about the topics in a given course and about the course itself. The latter is not the least

important since participants may be drawn from different cultures with different languages and discourse types. There are more than purely linguistic differences between learners with different mother tongues. Cultures and socio-cultures also differ as to what one may properly say and how one may say it. This has been very evident in our on-line course runs with Norwegian, Polish and Chinese students and during face-2-face venues in Europe and Asia.

SUMMARY: I for Integration

These three facets may not be very interesting in and by themselves. But I believe that the requirement that they should be integrated is.

From the conceptual or linguistic perspective, we may say that learning entails the ability to name phenomena. This both presupposes and conditions the ability to produce utterances and mental images that combine to form contextual meaning. This *know-what* aspect is oriented towards our ability to discern and communicate about phenomena. From the practical or operational perspective one may learn specific operations, how they string together to form procedures, how procedures collate to form operational competence in a given field, etc. A good term for this is *know-how*. A third type of knowing concerns how we become able to generalize beyond the specifics of a task or a discourse and thereby transfer knowledge across domains. This is *know-why*. These three ways of knowing translate to educational practises. Students should experience things and do things on the operational level. They should be strongly encouraged to talk about it, express themselves and listen to others in topically relevant ways.

We can pose this as a series of questions directed at developers and executors of e-learning offers:

- What are the ideas/concepts that this course strives to convey? What is commonsensical and what is truly specific for this particular subject? What are the specific *educational* ideas that enlighten the formal structure and execution? What is the relationship between these two domains: How does the course conceptualization express and convey the particular knowledge domain?
- What are students and teachers expected to *do*? How do these activities translate into deep conceptual understanding of the topic as such? How does the course entail socialization to become a contributor and engaged member of this particular learning community? How does better conceptual understanding translate to other kinds of doing – in terms of study and field practices?
- What are the naming and vocabulary conventions for both course content and course components? How is discourse about topics and didactics made visible and available to all? How is it observed, measured, developed and corrected? How is discourse internalized

and externalized – how do advances in the lexical abilities translate to deeper (conceptual) understanding and more intense or precise (operational) study and visa versa?

Each question has an addendum: To what extent does the answer build upon or take into account current digital developments? Here we are asking for both direct and indirect effects. Direct effects are well known as the unprecedented ability to communicate visually and orally in real-time (and time-shifted time) using Internet technologies. But indirect effects are also important as with the (similarly unprecedented) possibility of real-time venues in most corners of the globe. Such face-to-face meetings are made possible by budget airfare that in its turn is made possible by Internet-based and automated booking systems.

Do what I say – Not what I do: The Memetics of Learning.

The pedagogical role of imitation in learning forms an essential building block in the ICON principle. The following are brief background comments where I relate imitation to other educational approaches.

Kearsley (2005) lists fifty educational theories. From this we extract and align imitation with two other well-known elements:

- The first principle states that we learn from experience. This perspective belongs to a set of theories of cybernetic feedback with Pavlov's experiments as the textbook classic. At the root of this learning mode lies the idea that we change or plan our course of action in light of the pains and pleasures that we have come to associate with particular behaviours and conditions.
- The second principle concerns learning by mimesis – by imitation. We are not pre-programmed at birth for all the particular behaviours that we may perform over a lifetime. We have the capacity to register what others of our kin are doing in particular situations and mimic that response under similar conditions. This principles lies at the heart of the ancient Master/Apprentice approach in education.
- The third element represents yet an evolutionary departure from the two previous modes. Albeit some animals may be taught the meaning of a limited set of signs, human beings are alone in using formally structured – syntactic - symbolism. We are able to internalize symbolic expressions that are produced by others. We can ourselves externalize our experiences and insights using commonly accepted signs.

Since symbol-derived cognitivism is so ingrained in the Western philosophical tradition and since it so often comes across as immaterial, it is important to relate this to the material aspects of symbolic work with writing as a core tenet.

Coulmas defines writing as a conventionally accepted way to represent linguistic units by graphical signs on a durable surface for the purpose of communication (Coulmas 1989). It may be useful to extend this notion of the written word to a wider range of recorded expression. We will consider still images like pictograms and ideograms, sound recordings (audiograms) and moving images (videograms) as *texts*. For lack of a better term I *use to create text*, or *to text* for short to label the activity of producing them.

Coulmas lists six important attributes of writing (or *texting*): mnemonic, distancing, reifying, controlling, interactional and aesthetic:

The mnemonic or recording function supports individual and collective memory. The distancing function enables us to communicate outside audible and visual range. Together, these two have broken the collateral confines of time and space on our exchange of ideas and observations. These two aspects of texting systems are the prerequisite for desituated discourse.

Not only is the oral bound to the here and now. It is also intimately linked to the speaker/performer in a definite conceptual context. It has, in Coulmas wording, a specific deictic centre. As such, oral statements evaporate once they are uttered. Their written expressions on the other hand take on a material life of their own. The focus is shifted from the meaning of the speaker to the meaning of the word.

In writing we need to make the situation explicit; to make explicit the deictic field. A substantial amount of writing is therefore spent on clarifying intentions and situations. In Coulmas' words:

> *Reification means that a linguistic message becomes interpretable as detached from, and independent of its, conceiver.*

Writing does not only convey de-situated meaning as such. It is also a technology for social control, regulation and coordination. We follow "the book" and the "letter of law"; we take things "literally". This controlling function embraces writing itself. The written texts in the dialect of social elites form the core of normalized languages.

Lastly, writing has also its own aesthetic function that extends on and modifies that of oral presentation. This function pertains to the textual content as such, as in the conventions of written genres, but also in its material manifestations. The creation of signs in itself may be a major art as in Western typography and Eastern calligraphy.

Learning through symbolic means thus liberates the learner from the immediate social and material context. To some degree it consequently liberates from the immediate influence of practicing role models.

But one should remember the evolutionary foundation in feedback loops and mimesis for this development stage. We become adept at production and interpretation of signs through trial-and-error. We also – and to a dominant degree – express ourselves through creative plagiarism. This oberservation is aptly expressed in Georg Johannesen's proverb that *Ein lyt skjøna denne doble tanken: At alle tekstar består av sitat, og at alle menneske er diktarar* (Johannesen 2001)[1]. It resonates with Dawkin's (1976) remark on the *meme* as a self-replicating entity that is similar (in this respect only) to the gene. Susan Blackmore (2005) has further developed this ides. The following serve to summarize her view:

> *Put simply the hypothesis is this. Once human ancestors could imitate, memes appeared and began competing to be copied, their success depending on the type of meme and the preferences and abilities of the people doing the copying. .. If better imitation requires a bigger brain then this process alone will tend to increase brain size and improve imitation ability. .. (and) more memes will appear .. perhaps including the creation of rituals, clothes, body decoration or music, including behaviours that are of more advantage to those memes themselves than to the genes of the people copying them. .. In this way genes would be expected to track the direction taken by purely memetic evolution and thus we humans have ended up with brains that are not only much larger, but are specially designed to be good at music, ritual, art and, of course, language.*

Symbolic activity is here framed as dominated by copycat behaviour. It builds and maintains genres, fashions, word-of-mouth and a general emotio-conceptual traditionalism. At the same time new ideas and cultural expressions evolve at the fringes and in the deep bosom of society.

Typical examples of memetic stability are the genres of textbooks and curriculum descriptions or even the formal educational institution itself. These artefacts tend to develop into self-contained and self-referential entities. Albeit the symbolic content points towards phenomena external to the institution, the real learning is heavily impacted by the internalities of institutional life. In the same vein this may partly explain the seemingly irresolvable tensions between theory and practice on campus.

The ICON principle is here meant as a reminder: To what extent do we take for granted "campus socialization" when we develop new courses? Should we?

[1] Freely translated by me as *all texts are citations and we are all poets*.

By being very explicit on the conceptual underpinnings for the course type and course structure, for what student should do and why they should do it, it may be easier to identify areas of an educational effort that aims at bettering students' ability to be students.

Remediation

We read what others write and visa versa. In this way symbolic exchanges are not linear, but dialectical and circular. We understand this in the context of remediation (Bolter 1991, Bolter and Grusin 2000).

With this is meant that the circle of symbolic exchange is modified in concert with changes in the medium through which it is realized and in the notational system used to encode meanings. The movement from a mode where texts are written and distributed on paper to the use of the digital notational system is not only a technicality. It is not a neutral modification of tools. The change also impact what is said and done, how it is said and done and more importantly, the meaning and effect of such activities. This is one reason why we focus not only on meaning, but also on how meaning is conveyed practically (operationally) and verbally (nominally).



Figure 1. **Remediations: An imaginary rendition of Vannevar Bush's MEMEX is shown in the lower left. Although this system was to be implemented using microfiche and never fully materialized, the main ideas are now part of daily life through as the World Wide Web.**

Throughout the history of learning, there have been several modifications caused by such remediations. We are currently in the midst of a new turn where former modes of expression continue to live on while they are supplemented or overtaken by digital representation.

We are not only looking at how topical texts in particular subject areas are translated and transformed by digital notation and systems of capture, storage and dissemination. We should take an interest in how the whole system of learning is modified – the administrative routines, how

certification is carried out, the relationships and interactions, the power play of educational agents etc.

Symbolic activity in and by itself is seemingly essential for learning. But if it becomes detached from the world of practice it looses its *raison d'etre*; it becomes stale and scholastic. Another dimension in the learning process is therefore the emphasis on experiment, on practice and on case studies as this fits in with traditional and new forms of work and play.

Based on this we can define e learning as *digitally remediated circles of learning-oriented and practice-related discourse*. This comprises to some extent the expressive regimes created by people outside learning activities, but more importantly by the agents and agencies of learning immediately associated with this process, namely students, teachers, the institutional administrators and support personnel. An interesting and complicating factor here is that formal learning is undertaken at several stages during a career. We can no longer draw a sharp demarcation line between the social role of being a student and that of the employee.

Documentalism

Formal systems of learning have rules and organization. When we give importance to the operational and nominal aspects of learning, one immediate consequence is a strong interest in structured collections of texts – in *learner-oriented digital documentalism*. These expressions are commonly brought together or collated in some kind of container or repository. We refer to his as individual or collective *portfolios*.



Figure 2 Digital portfolios

If we collect most of the significant terms within a topical area, organize them and make explicit their relationships to each other we have gone a long way towards presenting one or more theories of that subject field. Examples of such term structures are word lists, controlled vocabularies, taxonomies, thesauri and ontologies. With referral to the ICON principle we may say that the conceptual level is structured on crossroads or junctions between operational experiences with

their underlying intentionalities on the one hand and these nominal expressions and other initiated acts of utterance on the other.

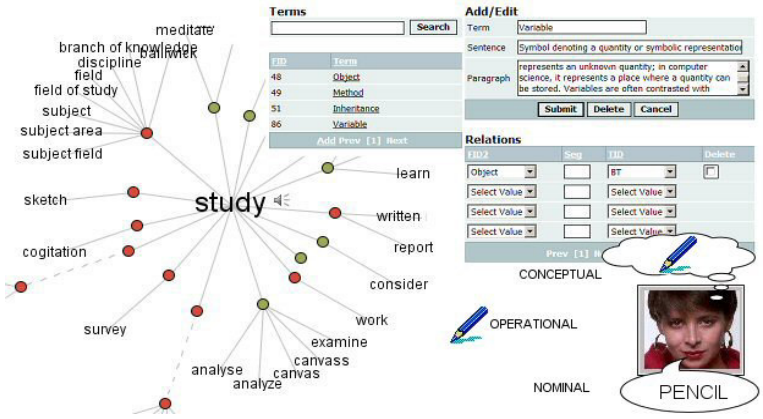


Figure 3 Semantic structure exemplified with a visual thesaurus

Since digital portfolios reflect upon global bodies of texts and since vocabularies and term structures are important to describe and retrieve them, we see growing emphasise on terms and phrases, their precise meanings and their mutual relationships.



Figure 4 Practical integration of the conceptual, operational and nominal

The image above shows an example from a training room for nurse students at Oslo University College. To the right is a student playing the role of patient in bed while two first-year students are doing the same bed supervised by two third-year students. The teacher (third from the left) overlooks everything.

Take note that making a hospital bed has a bit more to it than straightening the sheets. One should take physical care so that the patient does not move in unpleasant or dangerous ways. Students must learn to address relational care in terms of showing respect, making eye contact, oral

interaction etc. Making the bed has also "global" health aspects like preventing the spread of microbes. Etc.

On the wall there is a large screen displaying national resources on nursing where students and teachers may look up descriptions of various procedures and principles.

The same display is furthermore used to show details from demonstrations and tests that are captured by a video camera thus facilitating participation from all members of a larger student group. This will often be the case since space is tight. The screen additionally has the function of whiteboard for lectures in situ and during group discussions as shown in the smaller image inset on the lower left.

Text circle

Let us take a look at the text circle that I have briefly mentioned before. The one half in the illustration below may serve to illustrate the externalization process where students, teachers, authors and others write, produce pictures, make recordings etc. The other half represents the internalization part that covers reading, listening, observing etc

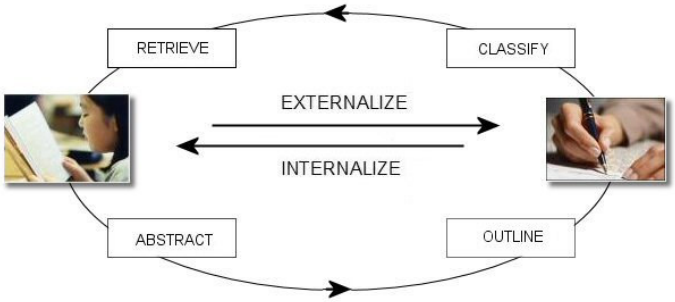


Figure 5 Text circle

But the circle also illustrates other aspects of importance. When we read something and analyze what we have read, we make mental notes or abstracts. In the context of formal studies they are recorded as notes in the margin or in more formal ways. In some cases this is also strongly formalized as the separate activity of writing. This supports memorizing and integration of new material within the previously established cognitive structures of the reader – or on the communal level, as the case might be. In the latter sense, abstracts and summaries form important components of collective memory.

On the other hand: When we prepare for the production of new text we resort to some kind of outline, sketch or storyboard. We may call this "pre-writing" before we write and more generally as "pre-texting" before we "text" to use these terms in a somewhat counterintuitive way. This locus in the textual circle is important. Learning could be enhanced if more students – and teachers – would nurture this process-oriented mode of collaborative creativity. In the Norwegian educational scene this is commonly referred to as *process writing*. These two elements are positioned within the half of the textual circle that leads from internalization to externalization.

After the fact - after we have expressed ourselves - we might classify what was said or otherwise conveyed. This is commonly called the meta-description of the topic, a description of the description or its classification. To this we may add contextual notes like references to similar content, provenance data and notes on publication. It may also be useful with descriptors on document attributes like number of pages for books, video format for analogue and digital video etc., publication date and placements in physical or virtual space like call number or URL (cataloguing). The output of these analytically descriptive processes is used to inform others of what we have done and to support identification, retrieval and selection. Classification and retrieval are also placed within the textual circle, but symmetric to abstracting and outlining. They are loci on the arc leading from externalization to internalization.

The activities of abstracting, retrieval, classification and cataloguing used to be essential elements of librarianship, while outlining and writing belonged to authorship. With digitalization, these activities merge. The previous division of labour is blurred to a point where these come to be general competence requirements for formalized and not-so-formalized learning.

ICON: A Documentalist Approach to Elearning

We can now bring together some important elements that we should consider when we want to create efficient e-learning solutions. We do so with reference to the following illustration:

The textual circle is rendered in more detail on the next page. It is composed of the read/write or internalization/externalization facets. These arcs are marked with loci of classification, retrieval, abstracting and outlining activities. In the lower right of the illustration we find a triangle with one vertex for portfolios that are produced by students and teachers, - the latter as teaching materials and other formal academic output. The second vertex represents cases and case studies that are used for illustrations and practical (operational) work in the learning process. The last vertex represents the terminological side.

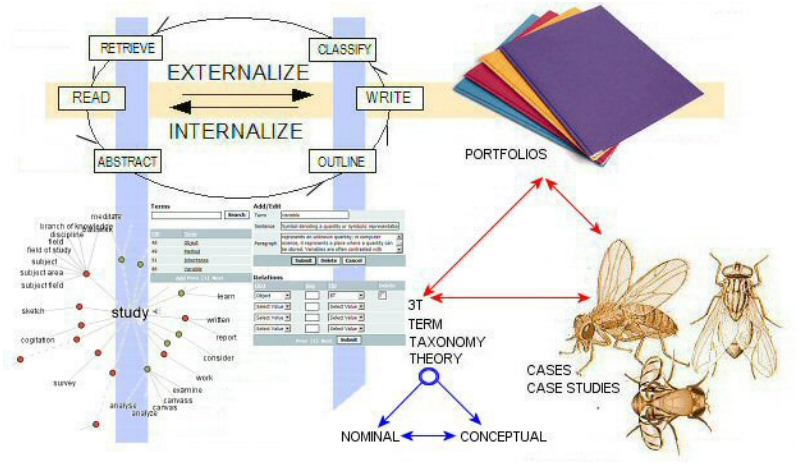
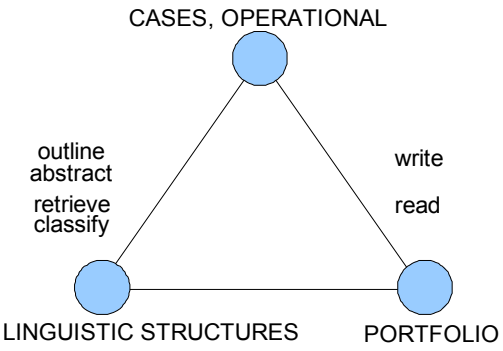


Figure 6 Details of the ICON principle. The text circle in the upper left is related to full text (upper right) and semantics structures

We will refer to this as the three T's standing for term, taxonomy and theory. This comprises the nominal and conceptual at several levels of organization and complexity. They span term lists (simple) through dictionaries and taxonomies to ontologies and formal theories (complex).

Considering these elements together we may construct a band that aligns portfolios to the fundamental acts of reading and writing as textual production and the main textual product.

Retrieval and abstracts are similarly aligned in one band while outlining and classification form another. But both these bands link to the terminological vertex. This may illustrate how the elements of classification, retrieval, outlining and abstracting are built on or result in semantic structures.



We can now clean up the illustration a little as shown to the right. This version better illustrates how the various elements of sequential and comprehensive texts that express views of a topical area (the portfolio vertex) and the terminologically structured (semantic) elements may be linked to operational work, cases, cases studies and other practical examples. We will refer to designs that systematically integrate all these elements as the ICON approach in e-learning standing for the Integration of the Conceptual, Operational and Nominal.

Didactics = Course ICONs

In the introduction to this paper, we put down the three principles of learning by conditioning, learning through imitation and learning by collective symbolic work. The two first are by nature contextual, while the latter also has strong contextual elements. This underlines the fact that students more than anything else learn to be students. Whether such competencies are relevant for actual practice cannot be taken for granted, but must be analyzed as open-ended empirical questions. This problem receives much attention today. How can the learning practices of being at school, college or university entail valid experience for other kinds of work?

We may also turn this argument on its head: For e-learning to succeed, we must succeed in training participants to be good e-learners. This has also the caveat that e-learning more easily integrates institutionalized learning with factual work practices.

Our long-term perspective is that shared by many (Nowotny 2003): There is a slow shift in learning practices whereby formalized learning integrates more deeply with work practices. The digitalization efforts in the last decades of the 20th century may be seen as early and therefore immature efforts in this direction. We expect that this relationship will be in flux for many years. It will find points of equilibrium that differ from those most prevalent today. For this reason, one should not see the ICON approach as relevant for the topical area alone, but also the activity of learning as such. Teaching and learning practices have their own conceptual underpinnings, their own nomenclature and its own operational practices. These must be understood and mastered by e-learning students.

Since e-learners generally have less same-space and real time interactions between themselves than other learners, e-learning imposes a stricter requirement for consistency and explication of this. Students should be particularly aware of such differences. As with the rest of us, students maintain "life worlds" that we here will refer to as *sets of relevancies*. As with the rest of us they monitor, select and de-select people, materials, events etc. based on extremely economic judgements of "what's in this for me" and "what's in you for me".

The ICON principle may act as a reminder to make the topic for learning relevant and accessible. But it can also give guidance when designers and teachers try to help students to transform and extend relevancies or "life worlds" which is to give importance and attendance to new kinds of materials, partners and modes of interaction.

E-learning Aesthetics & Semantics – Friends or Foes?

Eva Strøm

Semantics and aesthetics might seem as opposites, but in this project in connection with the Fragment course, Helge Høivik and myself has tried to connect the two in a meaningful cooperation. I will present two of the Flash animations and give you an account of how and why they were designed as they were.

The overview window in the Fragment website is built on the concept of integrating the conceptual with the operational and the nominal. (Fig.1)

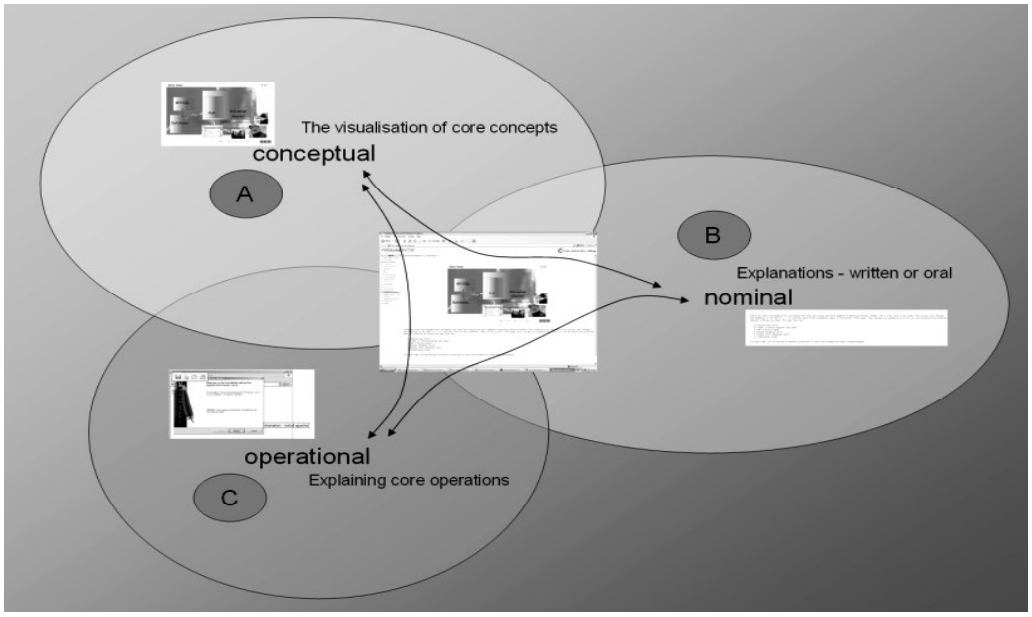


Fig. 1

A. The conceptual part, with my Flash animations, is supposed to work as visualizations of core concepts or let us say the basic principles of what happens behind the screen when you turn on your computer or the modelling of the logic structure of a database etc.

B. The nominal part, written text or oral speech, works as a supplement or as clarifications of the contents in the visual presentations. The web site has an inbuilt option to choose language to hear the oral speech, so as to serve the participants with a different mother tongue. The speech will be represented in Norwegian, English, Chinese and Polish.

C. The operational part takes you through the core operations with video animations that are recordings of how to execute different basic technical task – such as setting up the Apache Web server. Vibeke Bjarnø, from the Faculty of Education, has been working on these video animations.

In this context the visual Flash animations are supposed to work within a specific setting, not as aesthetic embellishments, but as an attempt to build knowledge and understanding through the use of images in an abstract setting, in the belief that knowledge and understanding are acquired through the use of all our senses.

"I hear and I forget
I see and I remember
I do and I understand"

The Flash animations – visualisations of core concepts

Run – time architecture

Architecture (computer science) – *"the structure and organization of a computer's hardware or system software"* (Visual Thesaurus 2)

The first animation is a visualisation of the run-time architecture as you turn on your computer or in a layman's language, what happens when you log on to your computer. We usually do not think about what's going on when we turn on the computer, but this animation is an attempt to visualize the complexity of the actions that are going on from the time that you log on.

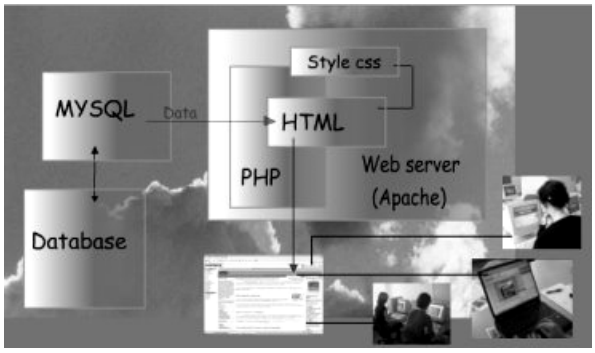


The background in this animation is an image of the sky to illustrate that we work in the virtual space. Several people are working on their computers and they are placed a little inside and a little outside the sky image as to say that we really exist in both realities: the real world and the virtual world. I have chosen to use two still photos and a small video to make this sequence a little dynamic. I had to stop the video and insert a still image to the scene to prevent the video from being a disturbing factor in the next stage in the Flash animation.

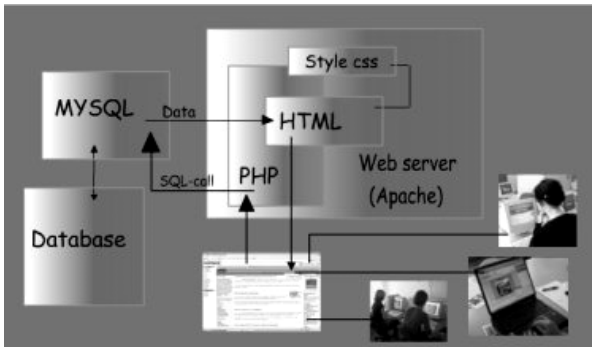


At this stage of the Flash animation all the computers are connected to an image of a screen display of an Internet page.

[2] These definitions are taken from the "Visual Thesaurus" database. The program is available at http://www.visualthesaurus.com/



So fare we have more or less been in the real world, but we are now moving into the virtual space where we se an intricate movement where information is to picked up from various sources such as the Apache Web server, the MYSQL database etc. The arrows, that appear, work as indications of a fixed path. One element in this process is linked to the other elements. The orders in which the elements appear are important so that we get the right end result, which in this case would be a digital application.



The Flash animation ends to show the whole path - from us starting the computer to where the correct screen display is presented to us on our computer screen. The last picture will give the course participants a general overview of the whole path and a chance to dwell on the whole process. The animation is an attempt to visualize the complexity of the actions and thereby give the participants of the Fragment course an inkling of the waste amount knowledge they have to acquire during the time of the course.

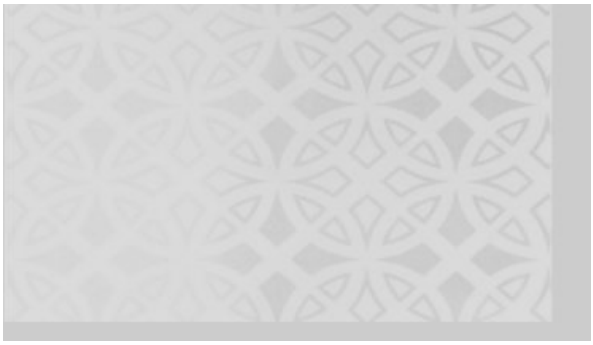
Modelling

Modelling – "*the act of representing something*" (Visual Thesaurus)

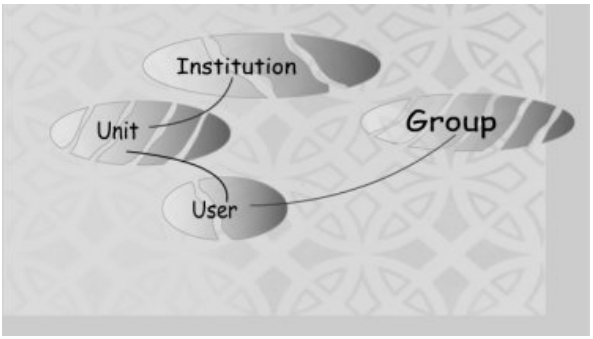
This is a visualisation of the main principles of modelling or the building of the structure which supports the logic of a database.

In the modelling process you have to analyse what kind of information you want to make assessable. Then you have to break down each element in the structure into smaller parts that connect to each other in different ways depending on the purpose of the application.

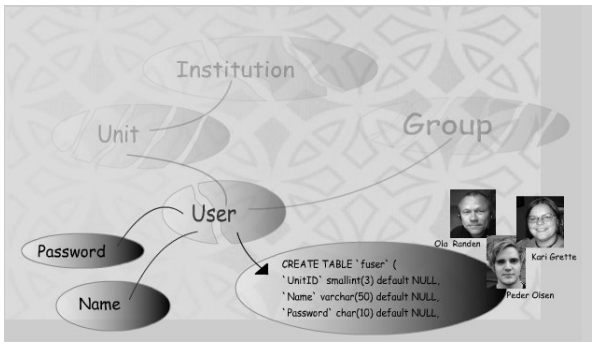
The Flash animation is designed as follows:



The background consists of a pattern build up as a logical structure where each part of an ornament is a vital part of the whole image. Each part is an entity by it self, but they are linked together to build a logical structure. I chose this pattern as a background image to illustrate that the modelling of a digital application is set up as a structure where each part is of similar vital importance to make it work.



The main components in this structure are: user – unit – institution - group. The different ovals that symbolises each of these elements are cut into parts to visualise that each element consists of several other parts. The connecting lines show that the user belongs to a unit in an institution and the user also belongs to a group.



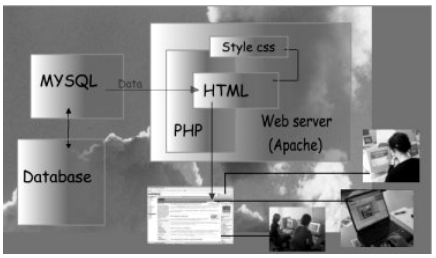
The next step is an illustration of how the user, in this context, consists of two elements. The users all have a unique name and password to identify them as they log on the database. When the SQL call is made to the database (Create table etc.) all the users that are registered with name and password in the database will be displayed in the

application. In the animation this is visualised as pictures with a name attached to it.

Again the animation ends with a still image of the whole structure to give the viewer a possibility to study the whole process in peace.

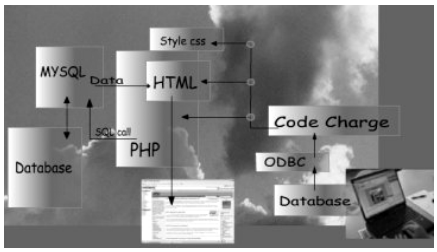
The first time you se any of these Flash animations they may seem difficult to grasp. But as the Fragment course proceeds and the participants acquire better and deeper knowledge and understanding; it is our hope that by returning to these visualisations of the core concepts, these animations together with the text, the oral explanations and the video animations will prove to be useful elements in a complicated learning process.

The animations that is available at this point in time:



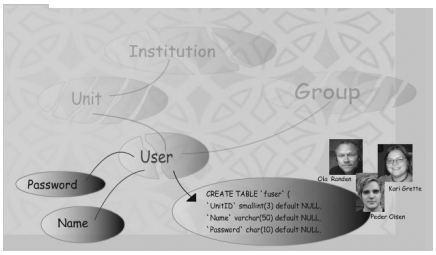
[Run – time architecture]

http://home.hio.no/~estrom/elearning/fragment/flash/runtime_620_360.swf



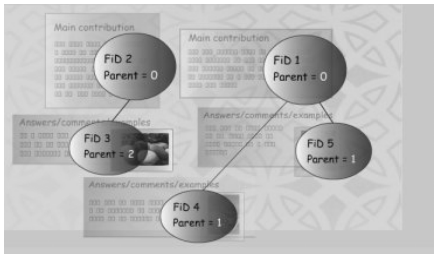
[Production environment]

http://home.hio.no/~estrom/elearning/fragment/flash/production_environment_620_360.swf



[Moddeling]

http://home.hio.no/~estrom/elearning/fragment/flash/modelling_620_360.swf



[Parent - Child]

http://home.hio.no/~estrom/elearning/fragment/flash/parent_child_620_360.swf

Visual Semantics and Document Structure – PART I

Eva Strøm

"Monster"

A digital application



This project is collaboration between participants in a Nordplus textile network that consists of colleges in Finland, Sweden, Denmark and Norway. These colleges offer study programs in design and weaving of textiles.

The Internet has given us access to new information cannels and as such the possibility to share knowledge in a degree that we where not able to before.

The purpose of this project was to develop a digital application where students and teachers would be able to find pictures of textiles linked to the diagrams showing how they technically can be executed.

In a creative process, such as the designing of textiles, it is of vital importance to have access to multiple sources of different materials from where you can gather the information and inspiration that is necessary to drive the process forward.

It has been important that the structure of the database should reflect the hierarchic system of the different techniques in the subject theory of this craft.

Here I would like to point out some of the challenges we have dealt with since we started this project in the autumn of 2002, mainly that of adapting the digital and visual structure of the application to the theoretic structure in the subject.

"The good example"

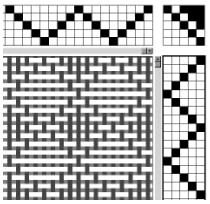
Example - *"something to be imitated"* (Visual Thesaurus)

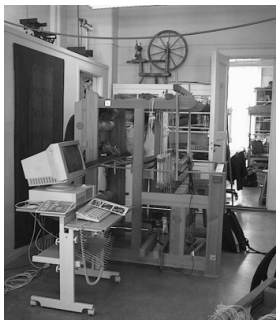


It all started when I made a presentation at a network meeting in Denmark in 2002 of the first prototype database. It designed by Jorun Retvik and myself as our assignment in the Fragment course that was a part of the Senior Lectureship Program at Oslo University College.

This presentation triggered the participants and we started to discuss the possibility to design a similar digital application to our specific needs.
The members in this group all have very different degrees of digital knowledge, but they all possess a vast degree of subject knowledge.

Weaving is an old craft, but since the middle of the eighties we have worked digitally with drawing the technical diagrams that are the foundation of how to execute the actual weaving on the loom.





This means that we are used to working digitally in this subject and combining that knowledge with a craft that has hardly changed for thousand years. All the institutions also have digitally controlled looms.
I believe that the reason that we where able to start the discussion, and thereby the designing of the application, was that I could show the participants this example of a database. It was designed to serve a different purpose, but it was an example of how things could work. We could then start to set our own criteria's as to how we wanted our database to function.

The first prototype of this application was presented in the autumn of 2003. It was called "Monster" after the Norwegian word "mønster" which means pattern.

I will now take you through some of the stages in this collaborative process and highlight a few important aspects.

Visual structure –

Structure - "*the way in which something is composed*" (Visual Thesaurus)

The weave diagrams are abstract representations of the textile structure and of how it technically can be executed to produce a textile.

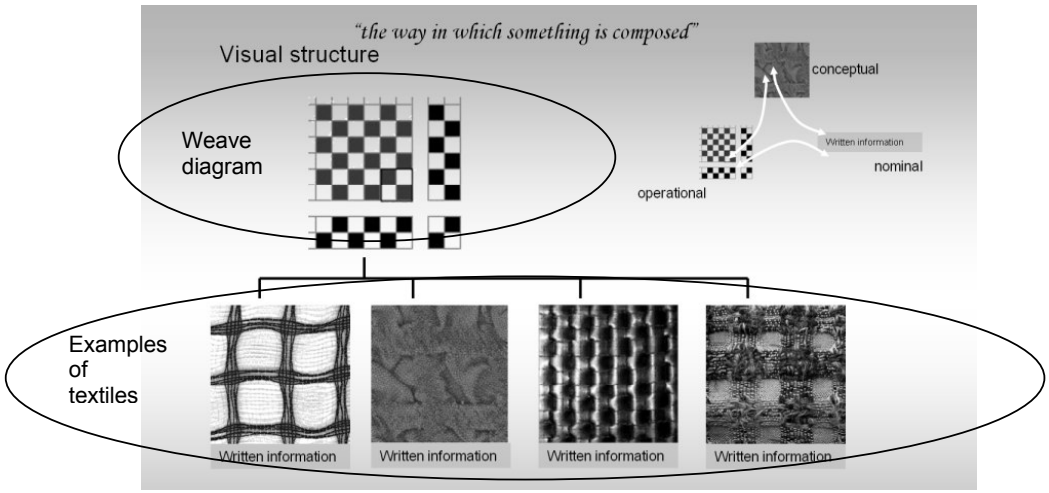


Fig. 1

We wanted a database where we could display how one technique could result in an abundance of different textile expressions as illustrated in Fig. 1 below. Each image would have a written text giving some basic information about the technique or the textile.

In this context we would display:

A - Conceptual representation, the image of the textile

B - Operational image, the technical diagram

C - Nominal representation, the text

In this way the database could work as a tool in the theoretic approach to the subject, but more important it would give us the possibility to display images of all the textile examples that we have gathered in each institution over the years. This material, together with more resent examples of

what the students are doing to day, would constitute an important knowledge and information pool and thereby enhance the interest for our Nordic textile heritage.

Theoretical structure

Theory – "*an organized system of accepted knowledge that applies in a variety of circumstances to explain a specific phenomenon*" (Visual Thesaurus)

The weave theory system has diagrams at the top level describing the basic structure of any given technique and a next level with diagrams depicting variations of this first technique. In Fig. 2 this is represented as the basic structure.

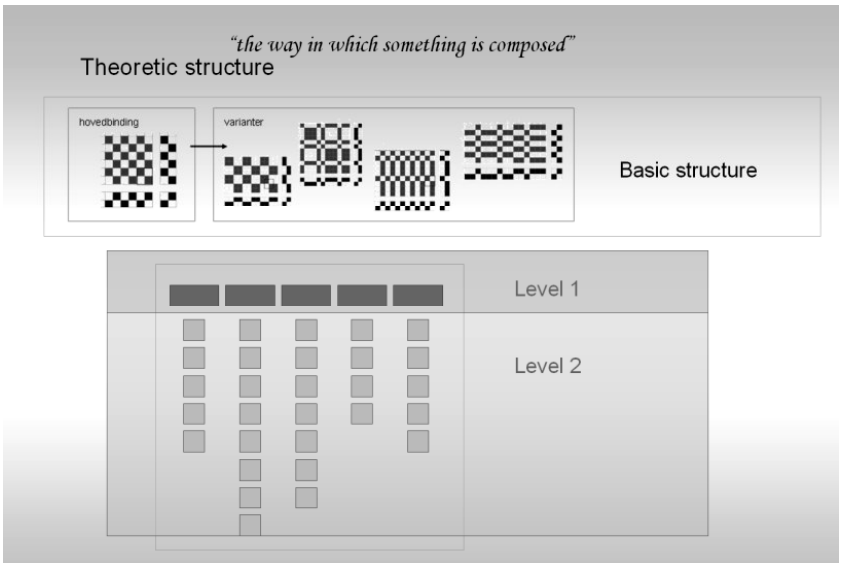


Fig.2

With this structure in mind the complete structure of the database would be presented with two levels:

- the main diagrams at level 1
- the variations at level 2

Digital structure

In designing the structure of the application we concentrated our effort to make it a mirror image of the theoretic structure. (Fig.3)

We arranged the theoretic diagrams in two levels as:

- fragment 1
- fragment 2

The corresponding images of textiles would be presented as

- fragment 3

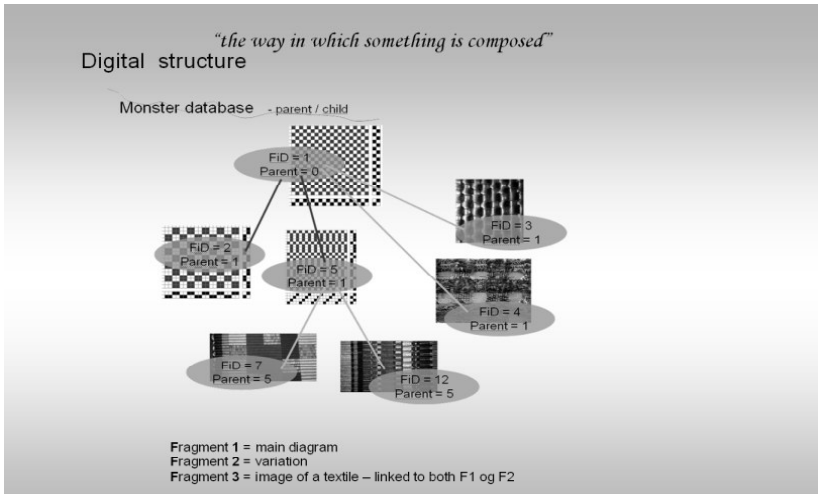


Fig.3

The first prototype was presented to the group in December 2003. It marked the beginning of the work that had to be done by each one of the partners in this project. We had discussed the structure, but now it had to be tested to se if I really suited every ones needs and expectations.

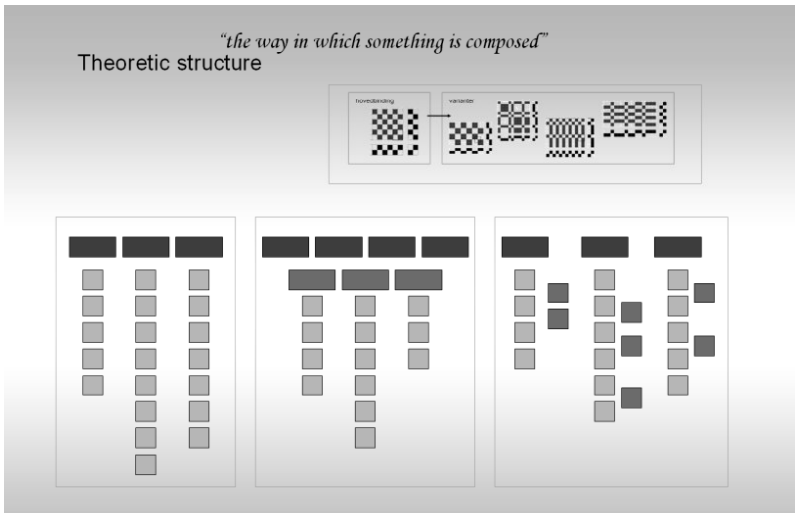


Fig.4

Theoretical structure

My first assumption had been that constructing the database with the two levels would work nicely. But as my Nordic colleges started to use the application it became clear that what, at the beginning, had seemed as a suitable structure really did not suit every ones conceptions of how to categorise the weave theory. At closer inspection it seemed that we really all had our different ways to organize this structure, not only with two levels, but at least with tree levels organised in different ways. (Fig. 4)

Reasoning – "*a statement that makes something comprehensible by describing the relevant structure or operation or circumstances etc.*" (Visual Thesaurus)

From the time of our first meeting, after we had started to work on the application, until today, the main discussion have really dealt with this problem of levels and an attempt to come to some sort of agreement on the organisation of the digital structure so that it could satisfy everyone.

We have been reasoning back and forth and we have tried different solutions.
It has been time consuming and tiring, but very educational and it has made us realize that we have more different views on this subject than what any of us knew in the beginning.

New digital structure

At this moment the database is structured with 3 levels at which to place the weave diagrams.
In all three levels there is the possibility to insert corresponding images of textiles. (Fig.5)

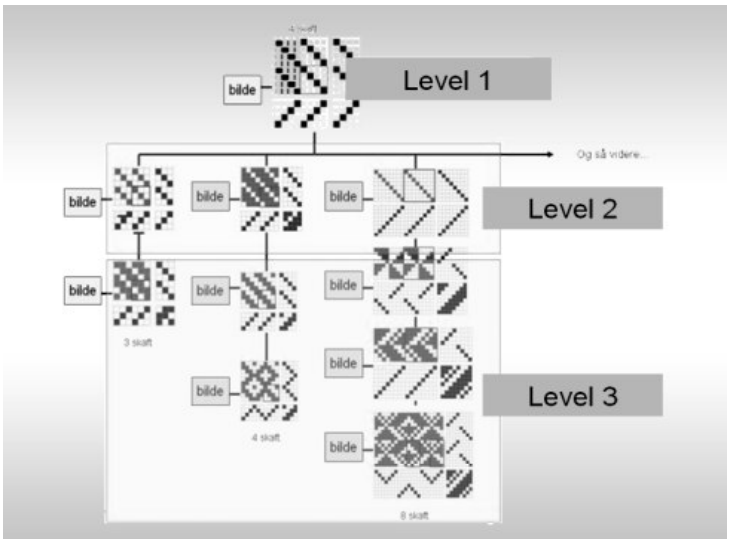


Fig. 5

We have:

- level 1 with the main diagram
- level 2 with variations on the diagram in level 1
- level 3 with variations on the diagrams in level 2

It seems that this logic is suitable and that it serves the theoretic structure the participants in this project needs.

It will give the application a pyramided shape with one diagram at the top and several more in level 2 and 3. In this way it should be relatively easy for the end user to navigate through the database.

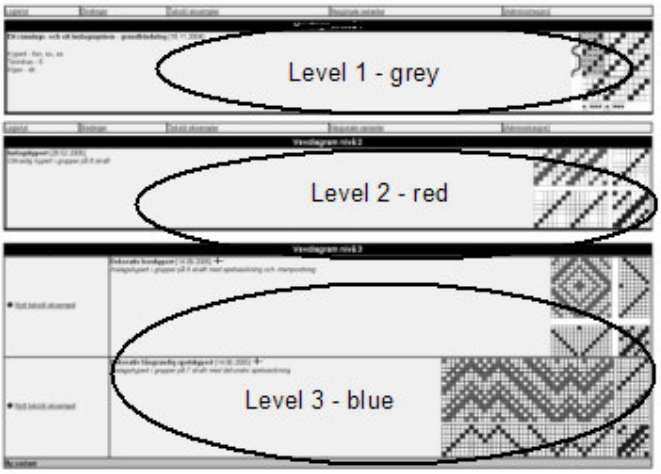


Fig. 6

grey

The main discussion and reasoning at this point have been the issue of placing the weave diagrams at their proper levels. The determination on which diagram that should be placed at level 1 will have consequences as to which level the corresponding diagrams will end up in.

To distinguish the levels from each other the diagrams in each level will be drawn with different colours and thereby strengthen the visual structure. (Fig. 6)

This has been a time consuming process, but it has given us an aver ness of the complexity of this issue and given us an opportunity to discuss this matter at a length and depth we never would have done otherwise.

Visual structure

Visual – "*relating to or using sight*" (Visual Thesaurus)

I have a feeling that the main objective of the database; that we should develop a digital application for the displaying of pictures of textiles linked to the diagrams showing how they technically could be executed; has somehow been overshadowed by all the work we have done on discussing the theoretic structure. (Fig.7)

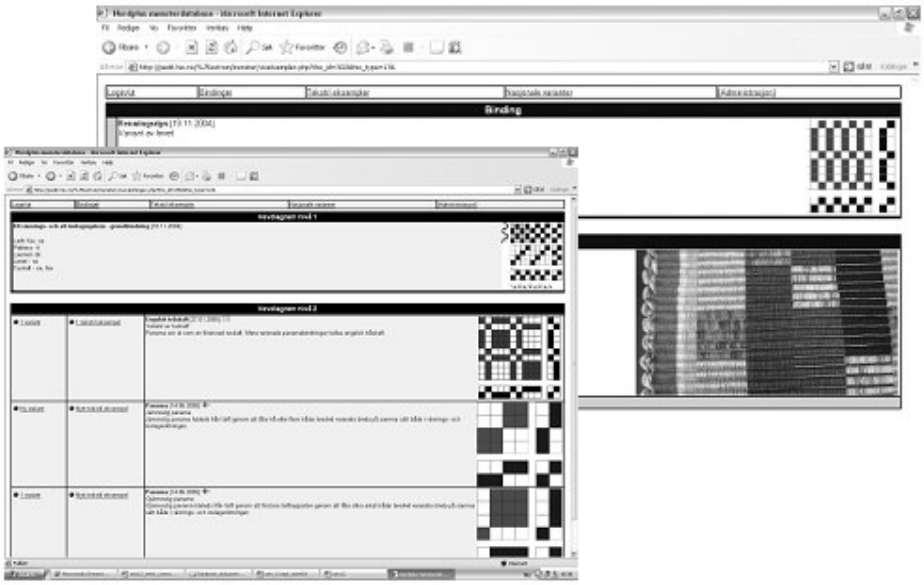


Fig. 7

At the moment there are far too few images of textiles in the database (Fig.8), but I hope that we, in this autumn, will be able to connect textile images to the technical diagrams so that the application may serve its original purpose.

Process

Process - "*a particular course of action intended to achieve a result*" (Visual Thesaurus)

Such a collaborative process is not linear. It works in loops and turns, or one step forward and two steps back.

The work has been executed on tree levels:

- The face to face meetings with discussions, analysis and the setting up of the criteria's for what kind of materials we wanted the database to handle and how we wanted this material presented.

- The actual designing of the application and the work that had to be done on revising it
- The "trying out" periods where the participants in this project has been working at home in their own institutions

The face to face meetings were important because we could work directly on the prototype. We all had the same references as to how things worked and what needed to be changed. By being able to do some hands on exercises together we could sort out some of the misunderstandings that would have occurred had we not had these direct confrontations.

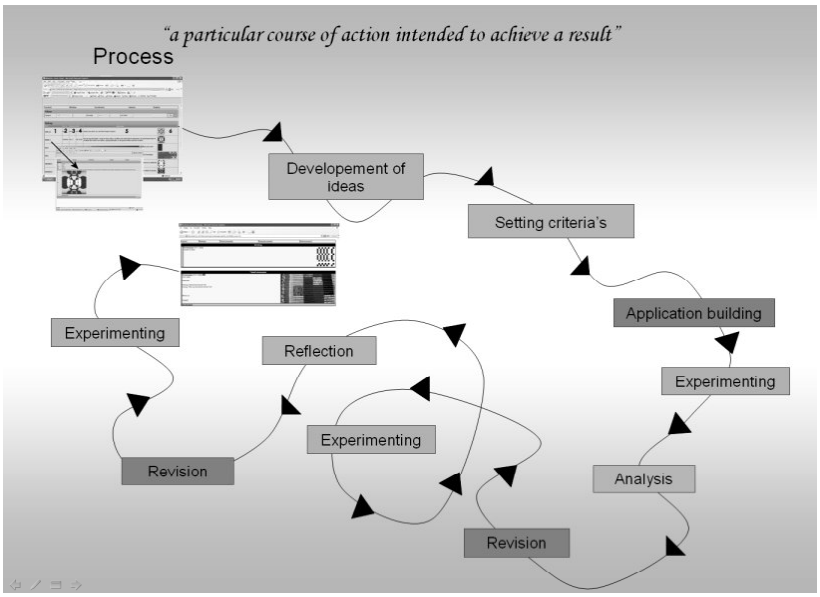


Fig. 9

The designing of the application was my project together with Helge Høivik as my councillor. This has been a sort of translation work on my part. I had to interpret and communicate to Helge what we had discussed in the groups face to face meetings so that we could make the necessary changes to the application.

The "Trying out" periods or the experimentation where important periods where my Nordic colleges would familiarise themselves with the application so that they could make it work in their own setting. Any desired change would then be discussed in the face to face meetings.

We are supposed to finish this work in the autumn of 2005 and I look forward with anticipation to our last meeting in October.

The question is whether we now can say that we are satisfied with the existing structure so that both teachers and students can begin to insert the weave diagrams and images of textiles to make this application an asset in the learning processes in each institution.

Visual Semantics and Document Structure – PART II

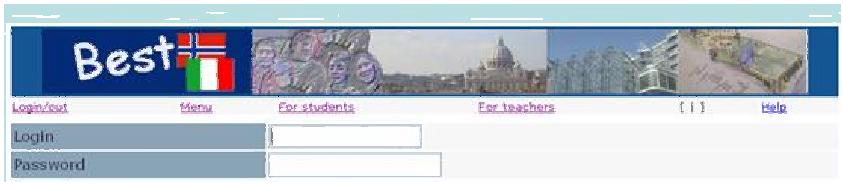
Jorun Retvik

I present the pedagogical model for two on-line projects where art and crafts functions as hub in international school collaborations. I also describe how this structure influenced the construction of the database application that we made for these projects. I will also show how the pedagogical aims in the model correspond to the Norwegian Core Curriculum.

In the end of the presentation three other of our e-learning projects in art and crafts will briefly be analyzed and located in the model structure.

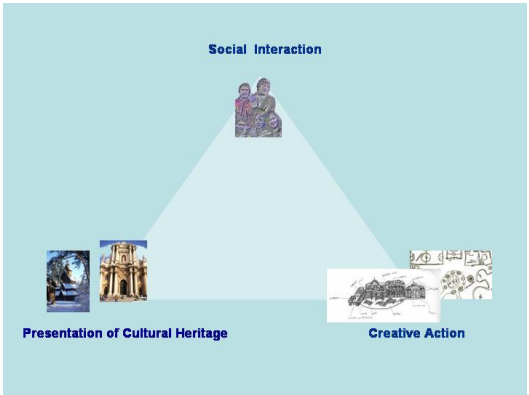
BEST 2004

The first project BEST in 2004 was a development project on architecture for art teacher education and with participants from secondary level schools in Norway and Italy. The project was supported with a grant from the Ministry Of Education of Norway and was developed by Helge Høivik and the current author.



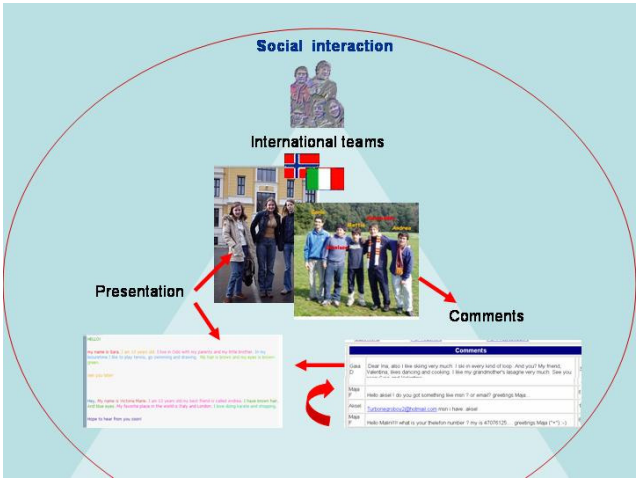
The structure in the application BEST is interpreted as expression of a particular pedagogical approach. It should fulfil three pedagogical aims:

- Social Interaction
- Presentation of Cultural Heritage
- Creative Action



Social Interaction

To support the cross-national dimension and collaborative work, the application build international teams with about four Italian and four Norwegian pupils in each. The pupils was about 13-14 years old and the first task they were given were to present themselves by digital photo of their national part of the team. They would also prepare a text which content a presentation of each member. The other part of the group would look in to the presentation and could give comments to the text and since they happened to be logged on at the same time, they could chat.



The social interaction were carried forward in to the following activities, but the in a less personal respect. We will come back to the social dimension in the other task later.

International socialization and collaborative work are main aims in The Core Curriculum For Primary, Secondary and Adult Education in Norway. Here quotation from statements of aims as formulated in the education acts:

Cooperation

- International CO-responsibility
- Favorable working climate and spirit of cooperation
- Strengthen .. cooperation at work and in society

(The Core Curriculum you can read it in English, Chinese or Russian on Internet. The Core Curriculum in Chinese you will find on http://www.udir.no/eway/artikler/?id=22012 and the Russian on http://www.udir.no/eway/artikler/?id=22024)

Presentation of Cultural Heritage

In the Best- projects in 2004 and 2005 the pupils have presented different aspects of their own cultural Heritage.

In 2004 the topic or term in the Best project was architecture (8th grade). In 2005 Light and Shadow was team for the children that participated from the in primary school (5th grade). The pupils should present their own culture and nature in the perspective of light and shadow. The history period was mainly the Middle Ages with the Vikings and knights.



In both the projects the pupils presented the subject matter in different ways. It should be a visual representation and a text in English that was the main rule, since the application demands an image as the first input after then you can add the text. In the architecture project the pupils were invited to take their own photos of traditional Norwegian or Italian houses in their own city and present them.

In the Light and Shadow project the presentations spent from drawings, digital photos of objects and nature, PowerPoint presentations and video animation. The teachers were encouraged to mirror the pupil's normal approach to the subject. The teachers in one school were so inspired of the ICT- project that they started to use video equipment they never had used. It was a gift from the local council and had not been laying around unused for years.

In these two BEST projects the topic in the second activity has been bind to the cultural heritage. A brief look in The Core Curriculum and this quotation indicate that the task fulfils the aim:

> ***Cultural Heritage and Identity:***
>
> *-Education should elaborate and deepen the learners' familiarity with national and local traditions*

- The domestic history and distinctive features that are our contribution to cultural diversity in the world. Presentation of Cultural Heritage

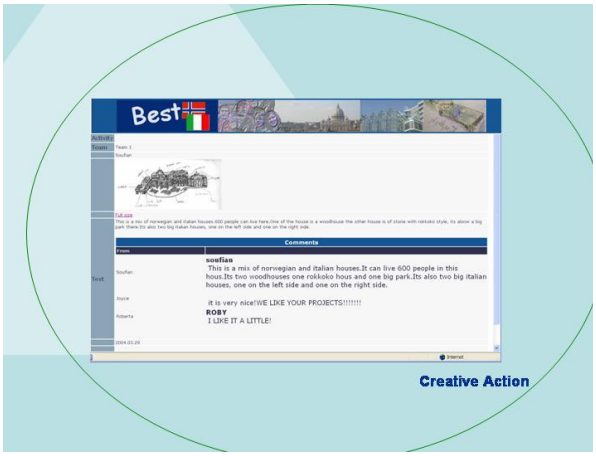
Creative Action

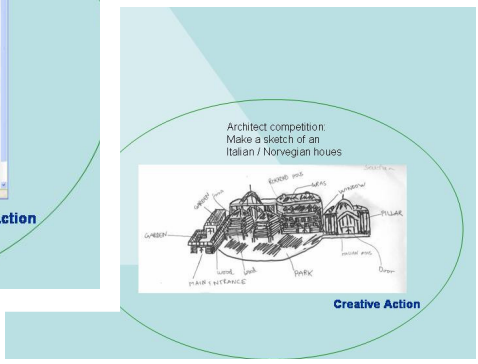
In the third corner of the triangle the pedagogical aim was Creative Action. The pupils should integrate and put the new knowledge domains from both nationalities to good use. In the architecture project that we have made up this story:

The Norwegian/Italian association want to build culture houses for young people, one in Rome and one in Oslo. Here is a quote from the assignment text:

> *Your international team shall make drawings of the main house of the resort.*
> *The house shall have typical features from Italian and Norwegian building tradition.*
>
> *Your international team shall make a plan for the outdoor sports, for instance football ground and pool. Make a drawing or a map.*

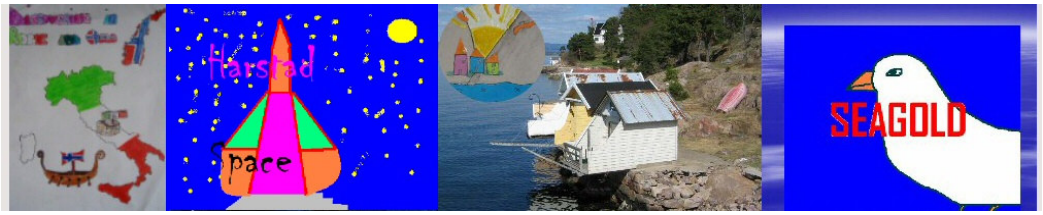
The teams should subsequently give comments to each others contributions to improve the proposals.





In the project BEST- Light and Shadow the creative action was connected to the subject "Travel Agency" and the pupils should present places to visit in their own country and they should make a logo.

These are some of their contributions:



The creative action part in the project and the open structure of the task and possibility for the pupils to make their own visual expressions make it possible to approach some of the aims in The Core Curriculum:

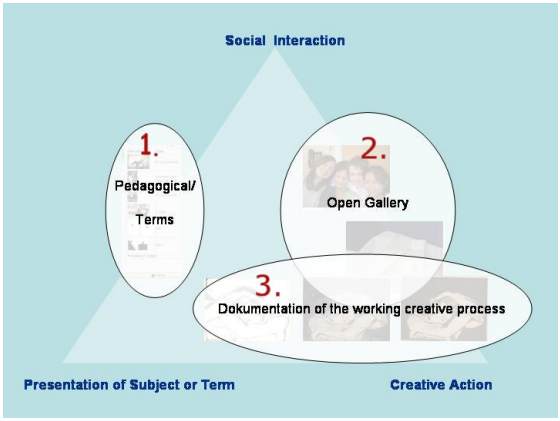
Creative Abilities

- *Develop mental and physical abilities*
- *Assist pupils in their individual development*
- *Scientific thought and method*
- *Personal development*

My last quotation from The Core Curriculum I would like to present in the centre of the triangle because the structure, the application and the pedagogical work with the projects can be a little step towards this goal.

> Education must teach and combine technical know-how with human insight, to develop a work force that is highly qualified and versatile, and to combine an international outlook with national distinction.

The image database we used in the Best projects has been usable in other pedagogical settings and for various tasks. I will brief describe three different cases where the application were suitable after just small corrections.



In the first case we used the application with our own students on campus. They should solve assignment bound to terms in art and crafts. They should work in groups and visualize the terms with visual examples and text for pupils in different age. The case (1) will be placed in the left side of the triangle. In the second case the student group should present stages in their creative process. This case (2) will end near the right corner. The third case is from secondary school, they wanted to present their architectural models and present themselves on Internet in the purpose to get partners to future collaborations. Their case (3), which we called "Open Gallery", I would mainly place in the line from creative action to social action.

Semantic Structures & Multi-disciplinary Integration

Vibeke Bjarnø

The introduction and use of Information and Communication Technology (ICT) has changed the meaning of learning, for instance for reading and writing. This post-modern situation challenges professional teachers in a new way, to integrate ICT in the pupil's everyday life learning (Bjarnø 2004). According to the new National Curriculum for primary and secondary school ICT are no longer an individual discipline, but a topic that should be integrated in the other disciplines at all levels (The Ministry of Education and Science, UFD 2005). Since 1997, the student teachers at Oslo University College have to fulfil ICT courses as a part of their education. The student evaluation carried out by the Faculty of Education over the last few years, shows that the student did not regard the ICT courses as an integrated part of their study3. In addition, when they were given assignments, they did not prioritise the ICT parts. Evaluation also indicates that the lessons and supervisions increased the ICT competence of students that have worked little with computers before their teacher education, but offers no challenges to students with high competence.

National research shows that student teachers and educator teachers do not know how to integrate ICT as a constructive tool in the disciplines (The Ministry of Education and Science, UFD 2003). Both students and teachers think that ICT is important. In their option to use or not use ICT in practice should not be a matter of individual choice. The lack of competence is not ICT skills, but, first of all, the need for some good examples on how to use ICT as an integrated part of different disciplines. This tendency in teacher education is also confirmed by research in primary and secondary schools. Teachers increase their ICT knowledge and skills. On the other hand they mostly use ICT to prepare lectures (Kløvstad and Kristiansen 2004). The teachers use more time in front of the school computers than the pupils, and the use of computer integrated in the other disciplines is low. As a consequence we can conclude that ICT has not yet become an important tool for the pupils' learning. International research also indicates that there is a gap between teacher's ICT knowledge and their skills to use it to support pupil's learning (Pope, Hare and Howard 2002). The question is therefore what can be done in teacher education to prepare students for the expectations they will have to face in practice, and thus support a process where the gap between teacher's ICT knowledge and their skills to use it to support pupil's learning will be reduced? During teacher education the teacher students have to experience good didaktikal examples for how to use ICT in learning, teacher educators have an important function as good role model's. ICT must be integrated in learning situations the same way as the demands in school

[3] One time every semester we carry through a student evaluation were the entirely study will be questioned. A lot of the questions are connected to ICT.

practice. My assertion is that the way teacher education administrate, make plans, carry out teaching and integrate ICT to support the students learning, has an effect on how the future teachers are doing it in later school practice. Close the gap between what student teachers are taught to do in school and the way ICT is used as a tool for learning in teacher education (Bjarnø 2005).

The solution in Teacher Education at Oslo University College is a movement form ICT didaktik[4] to multi-disciplinary didaktik where ICT is integrated with the compulsory subjects Mathematics, Norwegian, Educational science and Christianity and general religious and moral education. The orgazational model is expressed through a plan for the first division5: http://home.hio.no/~vibekeb/dokumentasjon_forstelektorprogrammet/konferanser/nera/vibeke/appendix-a05.doc

The Department of ICT's responsibility develop teaching material – adapted learning through blended learning

What is done to deliver multi-disciplinary lessons with ICT and teaching and supervision that both challenges the student at different levels and shows good examples for the use of ICT in learning? The Department of ICT develops arrangements where the adaptation of learning is done using the concept of blended learning. By a combination of online and traditional methods is used. Thorne (2003:16) define blended learning as: "…the most logical and natural evolution of our learning agenda. It suggests an elegant solution to the challenges of tailoring learning and development to the needs of individuals. It represents an opportunity to integrate the innovative and technical advances offered by online learning with the interaction and participation offered in the best of traditional learning. It can be supported and enhanced by using the wisdom and one-to-one contact of personal coaches."

Further, Thorne (ibid) writes that blended learning is a mix of multimedia technology, CD ROM video streaming, virtual classrooms, voicemail, email and conference calls, online text animation and video-streaming. Thorne says next that the important use of the new opportunities connected to information technology is to combine it with traditional forms of classroom training and one-to-one coaching. Somehow this is an integration of the best from flexible learning into traditional learning environment on campus. This means that the technology should be used to develop real learning solutions aimed at meeting the students' individual needs.

[4] The concept "didaktik" is does not translate well to English in the way it is used in this paper. Didaktik is used to emphasize the Central and Northern European connotations of the concept, and is intertwined of action and reflection, practice and theory. Different from the Anglo Saxon understanding of didactic, who is more a methodological concept (Gundem and Hopmann 1998).

In practice the Department of ICT provides the students to take the responsibility for their learning. They have to evaluate their ICT competence, and find out what they need in terms of support to acquire the ICT skills required by the study curriculum. ICT is connected to different themes in the compulsory disciplines Mathematics, Norwegian, Educational science and Christianity and general religious and moral education. And mostly it is the lectures in these disciplines who evaluate whether the students have enough ICT competence to pass. That means that ICT is demanded in the compulsory disciplines assignments. For instance, because the folder for textual assignments in Norwegian must be digital, they student's have to demonstrate their skills in file management. The students' have to use a formula and painting editor to pass the exam in mathematics, and they have to present their exam in Christianity and general religious and moral education as web-pages.

The student can use the teaching material in mainly one, two or three ways:

- As a web-based teaching material – 1: online.
- Get physical lectures (can be up to 350 students)
- Get supervision connected to assignments in computer suites (can count up to 30 students)

Lectures are given only in chosen themes. Most often it is developed a web-based teaching material with assignments, connected to supervision in computer suites. If necessary it can be given some lecturing also in the computer suites connected to the supervision in some themes. The *didaktikal* method will then be that the teacher demonstrates an example, and the students try to solve similar assignments under the teacher's supervision. The change between demonstrating and practising has given valuable experiences, especially to support the students with minimal ICT experience in advance. The method requires a computer suite with video-projector and one computer to each student. It is quite difficult to find available computer suites and lecturers, so it is not possible to carry out all the courses after this method. The use of web-based teaching material is therefore a good adaptation for the student with higher ICT competence, and also for other student as a preparation to supervision, and as repetition of the curriculum. [0]The web-based teaching material is mainly developed as hypertext, but involves links to different media such as sound and video-explanations.

The use of hypertext as genre

In 1990 Berners-Lee and Cailliau applied for a hypertext project. Hypertext is developed specially to link up and get access to information of different types on the Internet/Web with help from nodes a user can navigate between. The navigation tool is a browser, i.e. Netscape Navigator, Mozilla Navigator, and Opera.

Øgrim (1999) define hypertext as:

> *…a collection of text pieces connected by hyperlinks, lends over pieces of information, connect them together and organize it in several different ways, so it will be accessible and understandable for them who wants to use it* (my translation)

According to this definition, hypertext as a genre can be used to create a well arranged structure in teaching material. Hypertext also gives opportunities to link up other media such as sound, video, pictures', other files developed in different programmes, communication tools etc. The result is a web-based textbook; for an example: http://www.lu.hio.no/IT/grunnutdanning/0405/a04.htm

In addition to the student's web-based textbook, a Virtual Learning Environment is used for both administration of the study, communication with educator teachers and other student teachers, and publications as delivering assignments and exams6.

Experiences so far is that the teacher student focuses too much and maybe only on the ICT demands to pass exam in the compulsory disciplines in the teacher education. Development of a digital competence to manage the demands later school practice will reveal is not noticeable to the extent it supposed to be. A strategy has been to connect the assignments to their practice periods, were we still have possibilities for development. As the organizational model shows, a lot of different ICT themes are connected to the compulsory disciplines. The Department of ICT have been given adapted learning carried out as blended learning (Bjarnø 2005), but need more strategies for further development. The Department of ICT have to make sure that ICT is not reduced to only a tool and that the main understanding is that to develop a digital competence for teacher students, is more than a skill. The challenge and next step is to further remediate and develop new *didaktik* were the opportunities ICT gives in learning situations are exploited. Another strategy that seems interesting is to defining semantic structures.

Challenge 1: Remediation - multi-disciplinary *didaktik* with ICT

Earlier the Department of ICT focused on ICT-*didaktik*, while the new approach is to develop multi-disciplinary *didaktik* with ICT together with the lectures in the other disciplines. This is cooperation between different social systems in our teacher education, and can using a vocabulary borrowed from activity theory be called transitions and boundary crossing (Engström 1996). Transitions and boundary crossing are generally recognized as the key to organizational learning. Although the need for boundary crossing is widely recognized at the Faculty of Education, crossing over cultural

6 The information of the implementation of a Virtual Learning Environment at Oslo University College, see Bjarnø and Bjørke 2004 / Bjarnø and Sandtrø 2005.

boundaries in an organization where different professional groups are involved is difficult. The Faculty of Education at Oslo University College is organized in different departments, one department for each discipline. This organizational model represents a challenge to the development of a multi-disciplinary education where ICT is an important and integrated tool. To achieve a new multi-disciplinary approach, it is not enough to coordinate themes, or collaborate in some case studies. It is necessary to create meeting areas to communicate with colleagues through *didaktikal* dialogues, which will then play a major role in the processes of transitions and boundary crossing. To meet these needs, the methodical approach to this study is action research, and the analysis tool is activity theory.

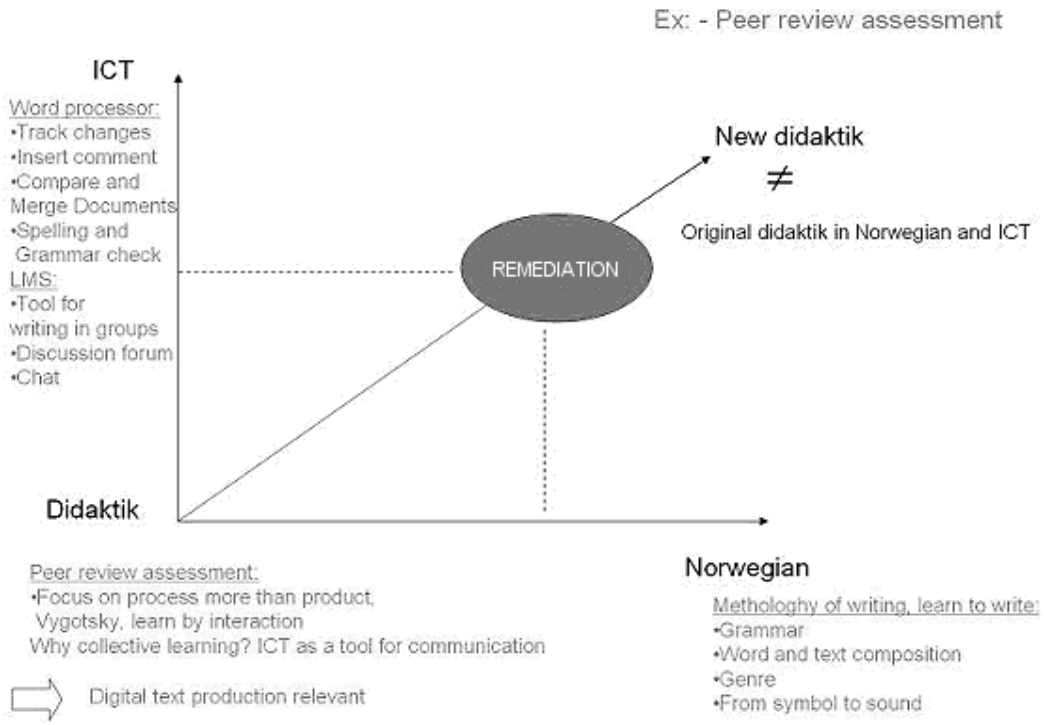
How to intervene the different disciplines with ICT is the main question. The used method of blended learning is not enough. The *didaktikal* dialogues between the teacher educators most initiate a remediation of the content in teacher education.

As Bolter and Grusin (2002:273) writes, is remediation the formal logic by which new media refashions prior media forms. "Immediacy" and "hypermediacy" are two strategies for remediation. A theoretical discussion of remediation is not needed, but some examples were a remediation have been done according to a new media will be interesting.

At the web-address http://www.visualthesaurus.com/ you will find a thesaurus different from a book were you have to lock up a word and read an explanation that refers to another page, you have to lock that up and so on, instead of seeing the connection right there and then on the screen. The visual thesaurus shows an example were the new media have been explored to develop and make it easier to use. To successfully remediate the ICT in teacher education, the Department of ICT has to go into *didaktikal* conversations with the teachers in the other departments and carry out transitions and boundary crossing.

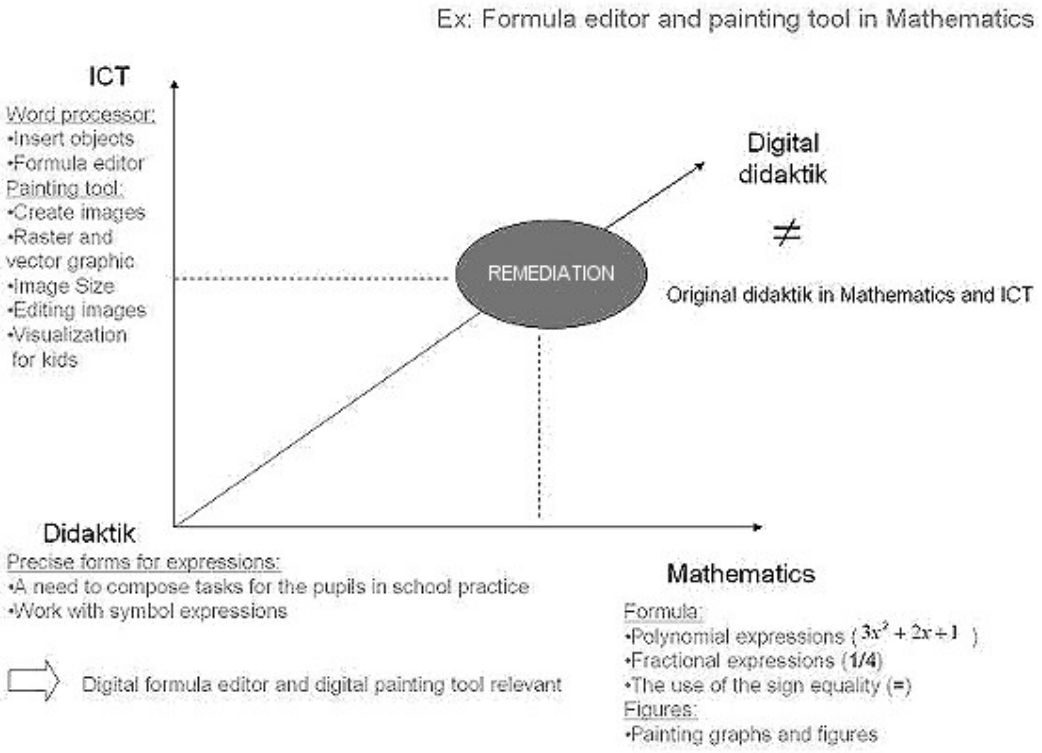
Academics from different theoretical backgrounds cooperate together to develop a new multi-disciplinary *didaktik* with ICT through remediation of this kind.

The following models expresses two examples were an agreement between the Department of ICT and the Department of Norwegian and Mathematics:



Example 1: Both the discipline Norwegian and ICT focuses on the theme Peer review assessment. The first year of the project we coordinated the theme parallel. The next year we started the *didaktikal* conversations which resulted in some agreements. The third year we continued to get a common platform for the teaching and supervision in Peer review assessment. The Department of Norwegian teaches theoretically around the theme, like methods for writing, learn how to write, including grammar, word and text composition, genre, from symbol to sound etc. The Department of ICT focuses on digital tools for Peer review assessment, such as a word processor with track changes, insert comments, compare and merge documents, spelling and grammar check etc. Tools for communication in a learning management system / virtual learning environment are also relevant, especially tools for writing in groups, discussion forum, chat etc.

Then we develop a common assignment were the student teachers have to connect points from both disciplines. Changes in educational theory promotes the relevancy of the use of digital tools in learning situations, and through this process it appears a remediation were new multi-disciplinary *didaktik* with ICT occurs.



Example 2: Formula editor and painting tool is relevant both as a digital tool in the discipline ICT and in Mathematics were it is important that the future teacher can write and paint mathematical symbols for young pupils. Teachers need to compose tasks/assignments for the pupils who are precisely and will not be misunderstood. Then they need competence in formulas like polynomial expressions, fractional expressions, and the use of the sign equality. Further figures, for instance how to paint different symbols in a certain related size to each other. In ICT a relevant theme is formula editor in a word processor, and a digital painting tool. In cooperation between the Department of Mathematics and ICT it was possible to remediate and develop a new multi-disciplinary didaktik who will give the teacher students a grater potential to use ICT in learning Mathematics in later school practice.

Challenge 2: Semantic Structures & Multi-disciplinary Integration

According to the Culture for learning, Ministry of Education and Research, all pupil's shall develop their basic skills; to express oneself orally, to be able to read, to be able to express oneself in writing, to be able to do arithmetic, an to be able to use information sans communication technology (Report no. 30 to the Storting 2003-2004)7. To "use information and communication technology" is

7 For an abridged version in English: http://odin.dep.no/ufd/english/doc/handbooks/045071-120012/dok-bn.html

defined "…to use and bring out/get forth, save, create, introduce, evaluate and exchange information…" (Ibid: 34: my translation).
As a teacher education we have therefore a demand to develop the student teachers digital competence:

> *Digital competence is the total of separate ICT skills as to read, write and arithmetic, and more advanced skills as an creative and critical use of digital tools and medias. ICT skills includes to be familiar with software, searching, locating, manipulating and controlling information from diverse digital sources and formats, while the critical and creative capability also demands a critical, interpretative and analytical relationship to sources, digital genres and media forms. Totally digital competence is thereby a complex competence* (Culture for learning 2003-2004:48 – my translation)

The vision of the Programme for digital competence 2004 – 2008 is: "Digital competence for all…Make digital competence everyone's property". What is digital competence for student teachers? Digital competence is a comprehensive term, and not yet finally defined. Digital competence will be different if you're a kid in children garden, or a pupil in a school, a teacher student or a teacher educator. For student teacher it will be helpful to focus on four different areas connected to ICT:

- learn to use
- use to learn – learn other themes and disciplines
- use to administrate and plan teaching and supervision
- knowledge, skills and attitude to ICT integration as a natural part of pupil's learning, pupil's everyday life – new *didaktik* during remediation and defining semantic structures

Defining semantic structures

The plan of eNorway (NHD 2000) describes Norway as a country for opportunities. The new technology forces boarders and the youth of today are already the most important agent's in this development. The SMS generation is tomorrows value makers. Therefore we have to listen and learn from them. The student teacher uses already digital tool – What can the teacher education introduce? A integral education were the student teacher's get the opportunity to further develop their digital competence, systematize it, show good didaktikal use of digital tools in learning situations in the way our student's are going to practice in later school practice. Why is a semantic structure a good strategy for taking a new step in this developmental project?

How to categorize the ICT content in the teacher education? IT must be categorized in main groups for what ICT is. Defining semantic structures is an attempt to get the teacher student to be a part of a categorization of ICT in main groups. What is ICT? They have to discuss the ICT in an abstract way not only on the operational level. It is through concrete and abstract dialogue the content changes character. First the student teachers must describe experiences, construct terms, which again will explore a semantic structure for new content in the teacher education at Oslo University College. To find out what is changed, is to describe experiences with ICT in learning, the result gives terms, that together results in semantic structures. These conduct different changes:

- Changes TEXT as a phenomena
- Changes COMMUNICATION and SOCIAL interaction as a phenomena
- Changes the MEMORY FUNCTION both individually and collectively (changing the habits)

In these learning processes terms of ICT, Norwegian, and Mathematics etc. are changed, they gets a new relation to each other, they changes the communication and the social interaction, and as a result changing the memory function about the phenomena in society. The student teachers play further with the phenomena in other situations that develop and change the memory function again. The definition of a semantic structure will also stimulate the remediation process which is necessary to construct new multi-disciplinary didaktik with ICT.

Example from teacher education – the use of a word processor in the discipline Norwegian
How to change the teaching and supervision so the teacher students also learn something about:

- digital editors
- digitalisation of the discipline, Typography
- computer functioning related to Word processors

It is necessary to introduce a theory and a concept of terms that define what is a digital editor, Typography, and computer theoretical. From the concept of terms it can be picked words that describe what we want the students to learn. In this example we have to ask what it means for the discipline Norwegian, that TEXT, COMMUNICATION and MEMORY changes character when we integrate ICT and develop new multi-disciplinary didaktik during remediation. In the process, "semantic classes" were equipped. A teachers focus on this, is in the same time to create a focus for the student teachers. In this way it can be possible to expand the student teachers learning request. Today a lot of the student teachers only want to focus on learning a minimum that is necessary to do to pass exam. Some student teachers only want to have a narrow focus on their ICT tasks, which reduces their development of digital competence as regarded in the governmental framework. We have to motivate them to do a wider work with ICT, not only operative, but also conceptually (semantic). Kirsten Klæbo (2005) has experienced the same

tendency in the Faculty of Fine Art and Drama. The students only want to paint, and when they are pushed to write, they express themselves in moderately term, not conceptually. It is our understanding, that to present the learning materiel in an ICON concept, Integration of the Conceptual, Operational and Nominal, it will further stimulate the learning process. For further introduction to the ICON approach, see Høivik 2006, in this note/report.

Example from primary school – the use of Internet to search for information

Pupils in a primary school got an assignment to find out the meaning of the word "sudoku", which is a Japanese word for a rebus were you put all the numbers from 1-9 in a grid. One pupil searches the Internet with Goggle for "sudoku explanation" and found a web-page with an explanation of the term; "su" means alone, and "doku" means number. The pupil took a copy of the text, sent an e-mail to the teacher and told that the meaning of "sudoku" is "alone-number". She did not make an explanation with her own words or described the meaning of the term. The teachers answer was: "then alone-number". The pupil did not understand that the teacher mend to say that you sent me a text which tells that "sudoku" is Japanese and are made of the words "su" for alone and "doku" for number – "then alone-number". A deeper explanation is necessary for a pupil in primary school to understand the teacher's answer. The teacher could not know that the pupil in her search for the answer had learned a lot more; a Internet search, that it is possible to copy a object from the screen by "choose all", "cut", "past" into a e-mail program. In such an operation it is a lot of cognitive learning going on in the pupils mind. The point is that in a combination of lessons with different disciplines, such as Norwegian and ICT, the teachers need to know that ICT is more than a technique who is subordinated to write. It is areas of action were both concrete and abstract learning takes form with text, explanations etc. changes character. To find out what is changing, is to put experiences into terms, to connect the level of experiences and action with the level of semantic (meaning). The example is about to see the text as a physical object that can be cut, pasted, saved, moved as a thing – which is a big change from the time without digital tools. Learning today, in a post-modern world is different from earlier time, who supports the necessarily of remediation.

Summary - Future Challenges

So what is, so far, succeeded in the project of integration of educational use of ICT? Evaluation from both the student teachers and our colleagues shows that we have made a lot of constructive cooperation's between the different Departments in our teacher education. During web-based teaching material, classes and supervision we have reduced the gap between what is done in teacher education and what the future teachers suppose to do in later school practice. Some of the agreements are more successful than other. But all of them have in a way given us new

experiences with development of new multi-disciplinary didaktik during remediation. The biggest challenge is that both the students and colleagues focuses quite narrow, and mainly on an operational level. The future will show if the solution is to defining semantic structures. It is important that a parallel process still make sure that that the educational use of ICT in learning raises. To reach this point it has been a long process, and still is a long process before we can say that the goal of full integration of didaktikal use in the new teacher education is reached. The Department of ICT has to further stimulate for:

- combining compulsory disciplines with ICT
- expand teacher students digital competence further than technical skills during:
- concrete and abstract thinking
- connect experiences with action – the semantic level, the level of meaning

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