Hypertext as incentive for dialogical learning: How students from different faculties learn from a painting and with each other

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Abstract: "Arts&Sciences" is a project where students from various departments, faculties and study fields corporately developed a web portal. The aim was to create a fascinating presentation of the universities involved for future students to facilitate their choice of study. The project is part of an interdisciplinary co-operation of three universities, the E-Learning strategy project "Delta 3". Our focus during the production was not predominantly the final product but the didactic design of the whole process - the collaborative process of production with the help of New Media. Our conclusion: This process of producing a hypertext in an interdisciplinary co-operation represents a new and unusual, but valuable form of E-Learning. Our experiences showed that hypertext - as developmental tool - in this context serves as a kind of catalyst for an intense and personal dialog between students. It supports and reinforces the traditional form of dialogical learning.

1. Delta 3 and the Value of Differences

In the framework of "Delta 3", co-founded by the Austrian federal ministry for Education, Science and Culture, three very different universities are cooperating: the Vienna University of Technology, the University of Natural Resources and Applied Life Sciences and the Academy of Fine Arts Vienna (see Fröhlich et al., 2005). Even though these three institutions are heterogeneous in various aspects they make an effort for a sustainable development of strategies for digital media in the everyday life of higher education institutions (Csanyi et al., 2006). Necessarily, this strategy has to be aware of the multidisciplinarity: Three very different fields of study have to work together – science, technology and arts. The three institutions differ not only as regards contents but also in their structure, organisation and culture. The basic idea was to learn from each other, to use the differences productively and thus, try to create synergies.

How can this be done? And what are the benefits of such a co-operation? The first and central process was to work on a common understanding of issues, key ideas which need to be agreed upon and to develop the ability to critically but respectfully deal with the heterogeneity. These are basic ideals of a special way of generating knowledge – this process was labelled "Modus 2" (see Gibbons et al., 1994). The Austrian scientist Helga Nowotny describes the differentiation between the two types of knowledge production as follows (1999)[1]: As "Modus 1" basically operates

[1] „Modus 1 ist aus der Suche nach allgemeingültigen Erklärungsprinzipien hervorgegangen. Er ist typischerweise das Organisationsprinzip innerhalb wissenschaftlicher Disziplinen, die durch disziplinierte kognitive und soziale Hierarchien gekennzeichnet sind. […] Während Modus 1 nach disziplinären Kriterien operiert, ist die Forschung nach Modus 2 meist transdisziplinär organisiert. [...] Modus 1 kennt klare Hierarchien, und meist wacht eine disziplinär organisierte, hierarchisch strukturierte wissenschaftliche Elite über die Einhaltung der gesetzten Qualitätsstandards. Modus 2 erstreckt sich über mehrere Forschungsfelder, ist heterarchisch organisiert und wechselt häufig die konkrete Form oder Konfiguration seiner Zusammensetzung. [...] Die nach Modus 2 bearbeiteten Problemstellungen sind daher weit weniger von vornherein vorgegeben,

within the borders of disciplines with clear organisational, methodological and hierarchical structures, "Modus 2" is interdisciplinary and includes different fields of research. Problems are not pre-fabricated and often arise during practical work. It is a network-like interplay of various competencies. In this context, difference is a high potential for learning (see also Welsch, 1994). The essential presupposition for a process like this is the mutual respect of the partners involved. Stereotypes and prejudices have to be avoided. Of course, a close co-operation with equal rights is essential for the success of the whole effort.

Interdisciplinarity is mostly viewed as a very modern concept but in fact its roots reach back to the ancient Greeks. It reflects "the ideas of a unified science, general knowledge, synthesis and the integration of knowledge" (Klein, 1996). But only in recent times a new focus on interdisciplinarity has developed. "Over the course of this century, metaphors of knowledge have shifted from the static logic of a foundation and a structure to the dynamic properties of a network, a web, a system, and a field." (Klein, 2000) Today, interdisciplinarity sometimes is a necessity in science, at the working place or more general: to be able to deal with the challenges of modern life. Some problems cannot be solved within a "simple" disciplinary position, they require an interdisciplinary approach. An important example in this context is the problem of climate change which cannot be tackled by one discipline alone. Other examples are nanotechnology or molecular biology.

Besides, interdisciplinarity can be useful to prevent excessive specialization which can produce problems in scientific, cultural and social respects. Last but not least, findings gained through interdisciplinary co-operations can contribute vice versa to the body of knowledge of the single discipline. These are only some of the reasons why interdisciplinary work should be part of modern Higher Education. The interexchange of concepts and knowledge as well as the co-operation which can bridge the often criticized academic communication gap can be a substantial contribution to a sustainable education.

In mathematics, "Delta" denotes the difference value – in our context, it means the overall value differences can have or produce. Moreover, the aim of the co-operation within "Delta 3" was to work together on all levels of the universities – with rectors, deans, teachers and students. The project described here ("Arts&Sciences") was a co-operation on the student level. It was primarily done by students with the support of two members of the project team.

2. Arts&Science: Multidisciplinarity

In the framework of "Arts&Sciences", the students involved and the supporting project members developed a website. In the end, it shall attract students who are just before their decision on their future education or choice of study field, in Austria that usually happens at the age of 18 years. The presentation should invoke "real" interest for the different disciplines. The reasons for that effort: Some faculties – especially at the Vienna University of Technology – generally suffer from a lack of students, whereas other faculties want to attract the "right" students because in Austria many students loose time - sometimes years - until recognizing that they made the wrong choice. Obviously, a linear presentation of study fields and curricula cannot fulfil this aim. Therefore, the idea for our website was to visualize the different approaches of the various disciplines: A tangible object was our starting point. Each discipline with its concepts, ideas and methods should analyze it in its own characteristic way.

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sondern werden von einem erweiterten und heterogenen Kreis von Praktikern in einem jeweils spezifischen und lokal verankerten Kontext gemeinsam definiert. Während „Modus 1" vom Ideal eines anzustrebenden allgemeingültigen Erklärungsprinzips getragen wird, betont Modus 2 das auf den jeweiligen Kontext abgestimmte, netzwerkartige Zusammenspielen von Herangehensweisen und Problemlösungskompetenzen."

For the first prototype, we chose a painting from Francesco Guardi (1712-1793): “Canale Grande con S.Simeone Piccolo/Venezia” which is in possession of the gallery of the Academy of Fine Arts Vienna, the “Gemäldegalerie der Akademie der bildenden Künste”. The object should provide the students with themes and topics. The students and their disciplines: Carina Alterdinger, a student of architecture from the Vienna University of Technology, Alexandra Augustin, a student of performance and sculpture at the Academy of Fine Arts, Laura Essl, a student of agricultural engineering and water management at the University of Natural Resources and Life Sciences, Monika Freyerlinger, a student of history of art and restoration and Ana Hoffner, a student of conceptual art, both from the Academy of Fine Arts, Peter Kristöfel, a student of physics and mathematics at the University of Technology and Tanja Rudolf, a student of management of environment and renewable resources at the University of Natural Resources and Life Sciences. Obviously, the topics of study could not be more diverging.

But not only the topics, even the methods and the cultures are different. The typical student at the Vienna University of Technology is straight-forward, fact- and career-oriented whereas art students learn in a completely different manner - their approach usually is much broader and socially embedded. Of course, these images represent a very simplified view regarding the individual students - but at least, they are common stereotypes and influence the way how the students see each other. However, it is not easy to create relations between such different spheres and people. But not less than that was the goal of our project, in the production phase as well as in the final website. For us, this was a challenge on the one hand, but on the other hand a very fruitful experiment as we learned during the production process.

Guardi’s painting of the Canale Grande in Venice in the 18th century - with people and buildings between water and sky on it - should serve as an inspiration for the authors of the website. Each of them should ask questions from the perspective of the respective discipline. Thus, the first main task of the students was to develop reasonable and

meaningful questions by means of which they can produce useful contents. Creativity was the driving force for this exercise – continuously, new questions arose, mostly within the team during the regular meetings. In this context, the participants learned to know each other, but also learned from each other.

Ideas came up immediately: On the one hand, the physicist analysed the material base of the painting, e.g. the colours. On the other hand he analysed depicted scenes, e.g. the physical processes that control the motion of the gondolas. The art historian and restorer highlighted aspects of history and conservation of art objects. The students from the University of Natural Resources and Applied Life Sciences dealt with problems of drinking water or flooding and the supply of energy and raw material. The art students described the life of artists in the 18th century, e.g. the role of sex or gender. In all cases we encouraged the students to draw comparisons with today.

Still, this would be just a collection of facts. Contributions from different perspectives would have been an ideal base for an anthology, multi- but not interdisciplinary. At this point, the medium comes into play. Thus, the idea was to escape from linearity with the help of hypertext. In the end, the portal shall support a self-guided and flexible form of learning. Therefore, we needed a presentation that makes the polyphony of the study fields visible and tangible and nevertheless is useful and fascinating. The user should be able to see that the borders between the various branches of study are not as fixed as frequently supposed, in fact, they are quite blurred and fringy.

Actually, some real-life problems need the co-operation of the different disciplines. And some questions only can arise during co-operations. This was something we also learned in the course of our production process. Hypertext seemed to be an ideal tool to represent these possible connections and coherences between the fields (see Joyce, 1995; Krameritsch et al., 2007 a & 2007 b; Schulmeister, 2002).

3. Hypertext – a Tool for Reducing Complexity

Hypertext – at least in its early days – promised to be "the" medium for establishing relations between different issues and human beings. References can be generated quite quickly. Just a link – and two documents are associated. This link really points to the referenced document and isn't just a distantreference like a footnote. Moreover, a hypertext network always remains "open", in fact it is never finished and infinitely extendable. In this way, the tool itself underlines the procedural and discursive character that is an intrinsic quality of all sciences.

Even for those who are not part of the production process, the network of multiple references is readable and understandable, under the presupposition of an adequate interface design. Readers and writers can establish their own coherences and get lost in a productive way. Unexpected discoveries in the network of units of information can be made. This phenomenon is known as "Serependity-effect". It describes the surprise when you find new perspectives, answers or questions. As research is sometimes seen as the ability to create productive difficulties or to make problems visible "where there were simple things before" (Bourdieu, 1993, p.57) in this sense, hypertext can be used as a productive "machine" for generating problems.

These were the reasons why in the early times of this medium some were euphoric about it: it could even be a "revolution of thought" (Landow, 1994, p.2) or "a land promised (or threatened) by post-modern theory" (Bolter, 2001, p.204). With this technique people are finally able to read or to write like they think – namely associative (Kuhlen, 2004, p.133). Information can be rearranged at any time, author and reader become equal, etc. – The following years showed that many of these expectations where too optimistic and too high. It became obvious that it simply is not enough just to transfer contents into hypertext and multiple perspectives would emerge automatically. Nobody cared for the process of production or the necessary competencies for reception.

Of course, this ideal medium for representing complexity can force flexibility and creativity in thinking. But experiences have shown that narrative hypertexts often are hard to read and to understand and - what is even more crucial - not at all easy to create, especially if they are written in a team. The central challenge above all is coherence which is absolutely necessary for orientation. Without coherence in traditional texts as well as in multimedia-networks understanding is impossible, it is the underlying base for the formation of meaning. In hypertext, a lack of it is one reason for the so called "lost in hyperspace"-phenomenon, the negative opposite of the "Serependity-effect".

Coherence requires planning of contexts and connections, a sensible fragmentation of information and the organisation of the network. Writing in a network is "non-sequential", you need to formulate short, concise and self-contained modules. Another challenge in this context is the co-ordination with all the other contributions and a reasonable integration into the network. Each unit can be a possible starting point for a link to other units. Therefore, it has to be independent or context-free – to make all connections plausible. The way in which the modules are linked with each other determines the whole structure – this is crucial for whether the hypertext comes to live or not.

Thus, the occupation with the associative pattern is the central task for creating hypertexts. If you do that in a team, a very close co-operation and a lot of communication obviously is necessary. A coherent hypertext does not grow automatically – it is hard work. And exactly that is its benefit as a didactical tool: There is a lot to learn because it IS difficult. Thus, it provides various opportunities: One is to make the connections between units of knowledge a subject of discussion, another one to develop competencies for teamwork and on an individual level, e.g. writing or reading.

4. Writing in a Network: Planning Coherence in a Team

For the support of our teamwork in the "Arts&Sciences"-project, we used a special content management system, "hypertextcreator" (htc) which was developed for another web project – "past perfect", a hypertext for history students. Already during the development of this CMS, the hypertext-specific problems of coherence were taken into consideration. The system structures the work of the team with a simple mechanism: A function automatically creates attributed links within the interface design as it asks for special metadata/information that were created during the production, so called "attributes".

For example: if a unit A is associated with the same "attribute" as B, the two will be connected via a link. In this way, context-sensitive links are created which show via which aspect the two modules are connected. With this additional information, it is easier for the reader to decide on linking options because s/he already knows to which domain the contents of the connected unit belong.

In this way, htc does not only support the reader in establishing coherence but also the process of structuring the contents and the links. This technical system forces the authors to think about shared "attributes" which in the end are the base for the links and are building the bridges between the units. In this process, the authors have to deal with different contents and the possible relations. For each "attribute", the team has to decide whether it is worth keeping it. So everybody has - at least to a certain degree - to deal with the contents of the colleagues. This means that during the individual writing process everybody has to have the co-authors and their work in his or her mind. Or in other words: The connecting process is part of the writing process.

For an example: The attribute "wood" provides a journey through the different disciplines, it is the material base of the painting (restoration and physics), it is the material for building the depicted buildings (architecture&cicil engineering) and it is a resource for energy (management of renewable resources). During the meetings this issue leads to further questions, e.g. where is the wood coming from? In this sense, not only the painting itself was an inspiration for the authors but also the perspectives and methods of the colleagues. Another example is the attribute "Angst" for a unit about the possible threats of flooding in Venice, for one about the fears of wastewater-related diseases and another one about social fears in the 18th century.

In this way, different narrative pathways emerged. This process required a lot of planning and communication. In this context, many questions arose: How to achieve a common spelling style? What is the main aim of the writing and what are the main interests? How to separate the workload? Which attributes to choose? How to adjust the pieces of writing and how to connect them? etc. We decided that it would be the best to discuss these and other similar questions during regular face-to-face meetings. A setting like that provides the best prospects for interaction, immediate direct feedback and for addressing problems, questions and challenges. Thus, all are involved in planning the final coherence of the product. In this way, the students not only learned from each other - they also learned to know each other.

6. Conclusion

During the project, we learned that collective writing is a special type of communication. For creating more than a simple collection of independent pieces of work, a functioning teamwork is absolutely necessary. The interaction between the authors has to be fostered and structured. Only in this way, synergies can emerge. Writing in a team means to confront oneself with the work of the others, with different contents. The co-authors have to think in coherences, associative and bearing the linking structure in mind. Everybody has to be aware of the general corpus during his or her individual writing process because redundancy should be avoided but connections should be possible at the same time.

But, if you take all these aspects into consideration, the interdisciplinary work with the medium hypertext leads to a lot of positive outcomes: As some questions only arise during co-operations, hypertext seems to be an ideal tool to represent the possible connections and coherences between the fields. Furthermore, it is a perfect didactical tool because in the collaboration process a lot of difficulties appear that are essential driving forces for successful learning. That is, there is a lot to learn because it IS difficult.

Last but not least, the team members have to develop competencies for communicating with students from very different disciplines and for teamwork. This leads to new fields of interests and the individual articulacy became much better. On the whole, the learned co-operative capability represents a new and important feature of their education.

In this kind of setting and application, the medium hypertext - as an E-Learning tool - probably is not as useful for big mass lectures. In other words: In this context, our aim was not to use the medium as support for overcrowded lectures. On the contrary, this design merely reminds on the classical seminar for small groups of people - not online communities - who are talking with each other about various topics. It is a setting which probably is not as reasonable for basic education but for the consolidation and contextualization of already acquired knowledge, especially for more advanced students. In this way, it presents a very “traditional” way of learning but with the help of electronic media.

In this context, “traditional” means that the new medium - the hypertext - has encouraged the old one - the seminar. The use of hypertext and its promises lead to the activation and the enhancement of face-to-face-communication during the “Arts&Sciences”-project. Hypertext allows to create meaningful relations between texts and contents, provided that the students are willing to talk to each other. Repeated discussion of the topics and their connections lead to a useful outcome for all the people involved. The experiences during the project showed that this was the central precondition for the production of a coherent body of knowledge.

Because of its inherent connectivity, hypertext structures the form of the seminar and functions as a catalyst in the working process. Thus, the new medium re-inforces the advantages of the old form. Under the objective of an ecological use of media, this can be a worthwhile effect, not only in Higher Education (see Giesecke, 2002). New and old medium are used at the same time, each one with its benefits and neither one in the centre.

In conclusion, during the whole project, interdisciplinary thinking and issues of media didactics provided basic motivation for an intense and personal discussion – which still is a major driving force especially in higher education.

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