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## Contentmanagement and Blended Learning: Beyond the Borders of the Classroom

### Abstract

The following paper goes beyond the context of the classroom, trying to examine e-Learning not only under the perspective of personal interaction in a course, but also under the perspective of possible effects on larger social communication systems like organisations and society. For this purpose, learning materials and learning interaction will be distinguished as complementary elements of learning arrangements. Both elements carry a very different potential for dissemination. Especially for electronic learning materials, this opens a wider range of possible uses, far beyond the classroom.

### Keywords

e-Learning, content management, organisation, learning objects, archives

## Content Management und Blended Learning: Jenseits der Hörsaalgrenzen

### Zusammenfassung

Der folgende Text geht über den Kontext des Hörsaals hinaus, indem er e-Learning nicht nur unter der Perspektive von Interaktion in der Lehrveranstaltung betrachtet, sondern auch Kommunikation innerhalb der Organisation Universität, als auch darüber hinaus als mögliche Kontexte untersucht. Zu diesem Zweck werden Lehrmaterialien und Interaktion als komplementäre Elemente von Lehrarrangements unterschieden. Gegenüber personenbezogener Interaktion eröffnen sich für elektronische Lehrmaterialien viel weitere Verbreitungsmöglichkeiten.

### Schlüsselwörter

E-Learning, Content Management, Organisation, Lernobjekte, Archive

“We already do distance learning at Stanford. It’s called the lecture.”

Donald Kennedy, President Emeritus, Stanford University

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# 1 Limitations of Personalised Perspectives on e-Learning

Following the sociological perspective of Niklas LUHMANN (1975), it is possible to distinguish between three basic types of social communication systems:

- *Interaction*, based on mutual perception among present actors,
- *Organisation*, presupposing membership and indirect communication, and
- *Society*, constituted by communicative accessibility

On basis of this classification many theoretical and practical contributions can be regarded to the topic e-Learning as rather person centred. On a theoretical level such a perspective is suitable especially for examining questions of learning psychology and of media didactics (see for instance the distinction of behaviouristic, cognitivistic and constructivistic learning paradigms in BAUMGARTNER & PAYR, 1994, and the didactical concepts drawn from this distinction). On a practical level, a personalised perspective is often used to deal with perceived problems of the individual teacher, for example how to design interaction in a given electronic environment (e.g. SALMON, 2002; HAEFELE & MAIER-HAEFELE, 2004). In both cases, the focus is on the individual person or on a manageable group of people in the context of either a physical or a virtual classroom.

Even if there are clear advantages and indisputable successes of this personalised perspective, this approach inevitably also has its deficits. Practically, a personalised perspective tends to overestimate the potential for direct interaction in educational settings e.g. by idealizing the interactivity of the traditional lectures, which especially in mass situations are often characterised by the verbal, nonetheless unidirectional broadcasting of information rather than by elements of mutual exchange. Therefore, e-Learning arrangements in residential education sometimes tend to overestimate the value of communication tools (or use them in ways that compete with non-mediated forms of interaction) and underestimate the potential and need for learning materials. A related problem is the reproduction of the chair holder principle ("*Lehrstuhlprinzip*", KERRES, 2001), meaning the tendency to take the chair holding professor and his equivalent, the autonomous teacher in the classroom, as the only relevant organisational unit for the production of higher education. As a result, the concept of the classroom as a closed black box and as the only place for learning is not challenged. Rather, organisational decisions on structures and processes are still predominantly built on this concept.

On a theoretical level, a personalised focus limits the ability to observe effects e-Learning can have on the organisation of the university, as well as on communication beyond the borders of the home institution, especially in the functional communication systems science and education. If one tries to overcome these restrictions, it seems to be necessary to take a sociological perspective, or at least a point of view, which enables to go beyond the single classroom (lecture hall, etc.) and to observe phenomena on the level of the organisation and of society as well.

## 2 Blended Learning

For this purpose, it is helpful to contrast traditional residential education and traditional distance education. TREVITT (2000) made the point that the flexible use of ICTs in higher education will blur the traditional distinction between residential and distance education. But what is the basic difference between both concepts? Strongly simplifying Trevitt's idea, one can say that residential education traditionally was based on synchronic and verbal interaction, while distance education was mainly realised in asynchronous and material based interaction. If the assumption is true that the use of ICTs leads to a blurring of residential and distance education into a vast range of blended learning scenarios, then both the providers of residential and of distance education can learn from each other.

In the past, distance education was based on the production and the asynchronous exchange of materials. The learner was sent written learning materials plus written instructions, and returned his homework in a written form. Today, the use of synchronous forms of communication, like chat, voice-over-IP or the live-broadcasting of lectures and presentations, increasingly gain importance in distance education, which can lead to a transfer of new didactical arrangements (e.g. student-student interaction, group work, etc.).

In contrast to that, residential education can adapt to new forms of material based communication. In the past, most communication was verbal and the reading list often was the only learning material produced by the teacher himself. However, the educational use of ICTs requires an increased production of electronic materials and of written instructions. Asynchronous forms of communication, e.g. email or discussion forums, gain importance. As a whole, much communication that has been volatile and verbal before, becomes increasingly "materialised", fixed in digital form. Examples for that are new forms of written communication (email, chat, forum), the use of PowerPoint instead of blackboard and chalk, the recording of presentations, and the production of more written materials (syllabus, calendar, reading list, lecture notes, etc.)

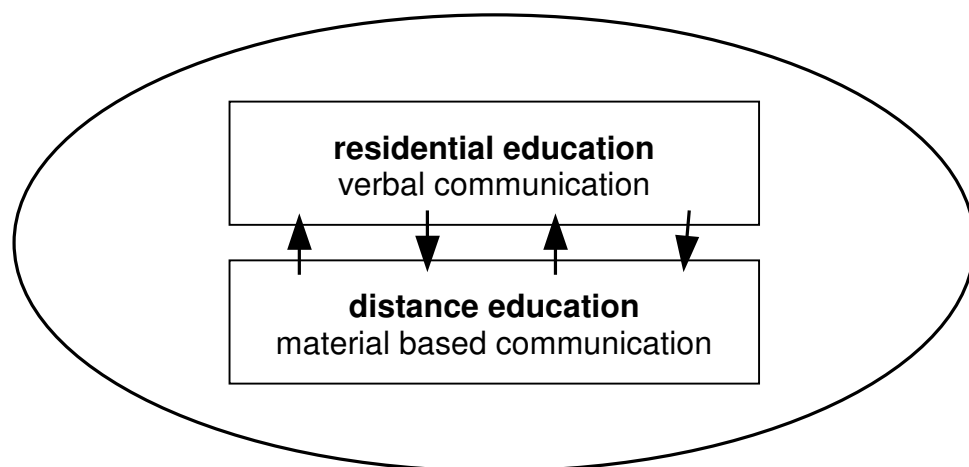


Fig. 1: Blended learning blurs two traditional concepts, adapted from TREVITT 2000

### **3 Material and Interaction as Complementary Elements of Learning Arrangements**

The use of ICTs in residential education makes it more obvious that education does not only rely on interaction of the involved participants. There exists a material component as well. It is possible to roughly distinguish between two types of materials. One type is the meta information on an educational arrangement, e.g. (commented) course lists, descriptions of courses, syllabi, calendars and announcements. The other type is learning material in a more narrow sense, e.g. lecture notes, literature, assignments, tutorials, self tests, etc.

ICTs in education make it necessary to distinguish different forms of personalised communication more explicitly and to use them more specifically. Different form can, for example, be the presentation of content, discussion with and between students, feedback about how imparted information was understood, consultancy to support individual work of students, and, finally, examination to decide about success or failure.

On the one hand, this distinction between material and interaction as complementary elements of formal learning arrangements makes it obvious that both residential as well as distance education require personal communication. Even if this communication is based on the exchange of materials or if it takes a written form, it still refers to the person of the individual student. His or her personal development is the goal of education and has to be assessed individually. Qualified and qualifying personal communication is a core requirement for formal education. This is the main reason, why education is still performed by education institutions, and not by booksellers or by the entertainment industry.

On the other hand, material and personal communication, the two core components of learning arrangements, differ considerably with respect to the ease of dissemination and the possibility to lever economies of scale. Even if it can be expected that ICTs will increase the efficiency in personal communication, e.g. by specifying forms of communication and by using them more flexibly, or by the division of labour and maybe even by the outsourcing of certain educational activities, this potential for economies of scale has its clear limits. These limits are set by the capacity for personal communication of individuals: a single teacher can only interact with a limited number of students.

For electronic learning materials, the situation is very much different. In the past, learning materials have been bound to a physical form of representation. Texts were fixed in paper, or in audiovisual recordings to magnet tapes. This made their reproduction and their dissemination logistically and economically expensive. The shift from analog to digital forms of representation and the evolution of the Internet changed this situation radically. The presentation of digital materials in online archives allows to boundlessly increase the number of potential users for neglectable costs per additional user. In contrast to that, analog materials (e.g. lecture notes, books, films) have to be reproduced and each copy only can be used by one person at a moment. Except of problems of bandwidth (which loose importance continually), in principle it is technically possible to make electronic materials

available to an unlimited number of people, without significant additional costs for the producer and without users competing for access.

Interestingly, the process of digitalisation leads to functionally new forms of redundancy and variety of organisational arrangements. From the perspective of a producer, to put electronic materials in an online archive can be a form of publication. Archiving and publication grow together and change their sequence in the process of production and utilization. Archiving increasingly becomes a task of the producer, while the user is relieved from it. The user does not have to store a copy of a document, neither physically, nor digitally. Rather, she has to organize meta information, e.g. the point of access to the original document. On the other hand, different chances for distribution and economies of scale lead to a stronger distinction between learning materials and personal communication. Both elements of the learning arrangement fall apart. This is especially relevant for learning materials. In the past, they have mainly been produced for the use in a single course, in the context of personal communication in the classroom. Now, new chances for the distribution of learning materials evolve.

## 4 Contexts of Use for Digital Learning Materials

Referring to the typology of social communication systems introduced before, it is possible to distinguish at least between three different contexts for the use of learning materials: the individual course, the organisation (e.g. the university, or a study programme) and society.

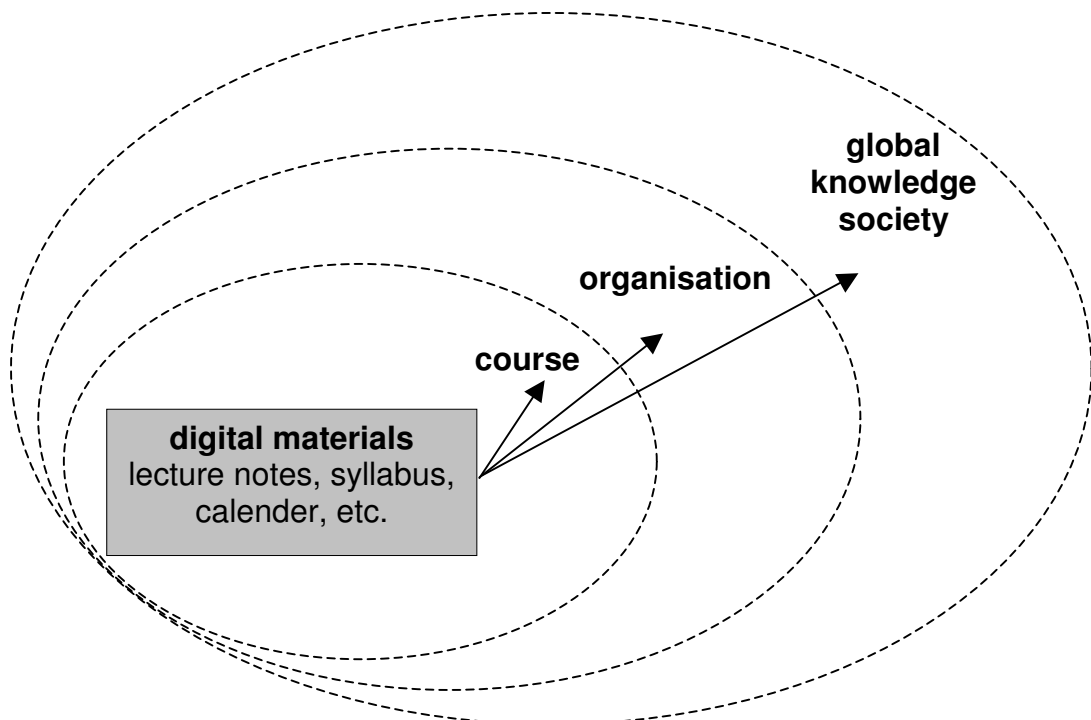


Fig. 2: Potential contexts of use for digital learning materials

## 4.1 The Course

In the past, the classroom built the physical, and the course the social boundaries for the personal communication between teachers and students. As far as available, learning materials were exchanged inside these boundaries. Apart from materials produced by the teacher, students sometimes exchanged their own notes, transcripts of lectures, their homework and final papers. Modern learning management systems basically rebuild this arrangement. In their core concept, they aim to support educational arrangements for clearly defined groups. They offer different tools for personal communication (chat, forum, etc.), as well as tools for the exchange of materials, which makes it easier for students to distribute their own products in the group. However, these learning managements systems also virtually reproduce the walls and the boundaries of the physical classroom. The single course is in-transparent from the outside. A login and the need for authentication guarantees that only enrolled students can see anything. While this restriction of access makes sense to protect the confidentiality of the group, since it provides a secure space for the personal communication between teacher and student, it also avoids access to materials, which not necessarily have to be confidential.

Internationally, the introduction of learning management systems proved to be very popular among higher education institutions. As the OECD found out, the adoption of learning management systems “*is clearly one of the most prominent features of e-learning development in tertiary education worldwide.*” (OECD/CERI, 2005, p. 157). However, the same study also finds a limited impact of ICT in the classroom setting and states that “[t]his partly reflects the influence of a ‘conventional’ course development paradigm.” (OECD/CERI, 2005, p. 14). Prominent e-Learning researchers, like Zemsky and Massy, suspect that this quick uptake of learning management systems might be among the main reasons for the “*thwarted innovation*” in e-Learning and the limited effects on learning arrangements (ZEMSKY & MASSY, 2004).

## 4.2 The Organisation

An alternative approach is to produce electronic learning materials primarily for the use in a specific course, but to make them available to all members of an organisation, e.g. for a study programme or for the entire university.

For students, who want to select courses for enrolment, accessible learning materials give a better impression about the goals and the topics of a course than a title and a short description could give. They also can prepare themselves for a course in advance, or come back to the materials even after they already have passed the exam.

Teachers can learn from each other browsing the materials and didactical concepts of their colleagues, without being indiscreet. They can get ideas for themselves or better coordinate their syllabi in the context of the entire study programme. Teaching itself partly can leave behind the status of a lonesome ranger status activity. Formerly hidden in the classroom and therefore invisible, accessible learning materials can create more visibility, at least for the members of the

university, which creates added value. Teaching can become a more collective task than before.

At the organisational level, it becomes easier to increase the consistency of learning programmes and to support teachers in the production of materials and in the logistics of making them available. Quite obviously, it requires special institutional investments to lift teaching on the level of the organisation. And it can be argued that this new transparency also would lead to increased social control among peers, which might be perceived as pressure by some. However, it also can be seen as a challenge and as a potential to improve the quality of teaching in an academically sound way.

### **4.3 The Global Knowledge Society**

Even a step further take approaches, which try to bring digital materials beyond the boarder of the organisation, aiming at their largest possible distribution. In times of the dot-com-boom, many of these attempts had commercial, for-profit goals. Some of them, e.g. Fathom<sup>2</sup>, a commercial venture of Columbia University, attempting to sell electronic learning materials, failed economically.

However, there are also some interesting, not-for-profit projects going on, which distribute learning materials on an open access basis. All of these approaches have one thing in common. They treat learning materials as publications, aiming at maximising communicative accessibility, regardless of the organisational membership of the potential user. While the personal communication necessary for formal education still depends on organisational membership in the respective university, and, even more focused, on registration in a course, the electronic materials produced for the same course gain added value as a medium for publication, which can increase the reputation both of the individual author and of the providing institution.

## **5 Characteristics of Learning Materials**

What exactly are learning materials or educational resources? The materials used in higher education are frequently a conglomerate, composed from different sources, like scholarly publications, empirical data, lecture notes, syllabus, reading list, etc. As already mentioned, the digitization also leads to the production of new types of materials, for example by using PowerPoint, by new possibilities for audiovisual recordings, or by new written forms. Also new is the creation of interactive applications, for example the visualisation of functional relationships in simulations of experiments, or applications to perform self-tests.

Problems in the context of learning materials are on the one hand questions related to their production (for example the decomposition and recombination of their components) and – closely connected – on the other hand questions of distribution beyond the original context of production. The often mentioned goal of inter-

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<sup>2</sup> Fathom: The Source for Online Learning: <http://www.fathom.com/>

operability (“*the ability to cooperate between different systems, technologies or organisations*”, WIKIPEDIA, 2005a, own translation.) is accompanied by extremely positive economic expectations (WILEY, 2002), these expectations have not yet been fulfilled, since a respective economy is still missing (OECD/CERI, 2005). However, pragmatically interoperability raises questions of archiving and of the standardisation of metadata.

Currently the debate on electronic learning materials is very much influenced by the idea of *electronic learning objects*. The idea is based on the concept of object-oriented programming, a paradigm in the computer sciences. “*The idea behind object-oriented programming is that a computer program is composed of a collection of individual units, or objects, as opposed to a traditional view in which a program is a list of instructions to the computer.*” WIKIPEDIA, 2005b. Increasing the modularisation into individual objects makes it easier to address individual modules or to relate several modules to each other. Otherwise, programme code only can be processed in a sequential way.

### **5.1 Three Metaphors for Learning Objects: Lego Metaphor, Chemical Metaphor, Organic Metaphor**

The idea of electronic learning object raises at least three problems: the relationship between learning objects, the question of granularity and the question of reuse. To tackle these questions, researchers used three different metaphors to get a better understanding of learning objects: the Lego metaphor, the chemical metaphor and the organic metaphor (WILEY, 2002, PAQUETTE & ROSCA, 2005).

The Lego metaphor is based on the assumption that learning objects can be compared with Lego bricks, which can be combined with any other brick and in any possible form. WILEY (2002) criticises this assumption as too simplifying and suggests instead, to compare learning objects with atoms, because specific atoms only can be combined with some specific others. Additionally, their form and their ability to connect is determined by their internal structure. Paquette und Rosca 2005, who described Whiley’s suggestion as a chemical metaphor, assess it as a necessary step in the debate. Still, they criticise that only the anatomy of aggregated unit is described, but not their internal dynamic. Therefore they introduce an organic metaphor to be able to compare the dynamic interaction between learning objects with biological processes.

From the comparison of these three metaphors Paquette & Rosca develop different analogies for the granularity of learning objects and for the development of larger units. The Lego metaphor supports the view that bricks can be assembled to components, and these to motors. The chemical metaphor conceptualises granularity differently. Atoms integrate to molecules, a mix of molecules causes a chemical reaction, which again can be arranged to larger, more complex experiments. According to the organic metaphor, cells form tissues, tissues become organs and these are combined to organisms.

The question of how to conceptualise the relationship between learning objects, as well as of granularity and aggregation determines the imagination of how to reuse learning objects. Especially in the case of Lego and of the chemical metaphor, the

imagination seems to be that the reuse, at least at the smallest, most basic level (brick or atom) is more or less possible regardless of the context, as soon as their definition and their metadata are established broadly. Reuse in this understanding means that an identical object (or its 'identical' copy) can seamlessly be integrated in the aggregation of a newly composed, larger unit.

## 5.2 An Alternative Metaphor: Literature

It is really striking, how much this debate on possible characteristics of knowledge resources is determined by physical, chemical and biological metaphors, a far reaching search for comparisons. However, it would be more convincing to compare electronic learning materials with closer relatives like traditional knowledge resources. The use of a literary metaphor, especially referring to the genre of scientific literature, seems to more appropriate as an image to search for possible analogies.

Internally, scientific documents are structured in chapters, paragraphs, sentences and words. More seldom are units like images, figures and tables. Similar to the definition of central terms, this formal granularity is very context specific and not easily transferable. The elements and components of a text are produced for the specific context of this text. They receive and produce their effect and meaning in this environment. A direct transfer of identical units (in the sense of a word-to-word quotation or of copy/paste) is normally only possible for very small units, e.g. for a few sentences of single images. To transfer larger aggregations (e.g. larger lines of arguments), this can only be done in an indirect way, at least for respectable scholarly work, e.g. by paraphrasing and referring to the original source, which normally is another document. While in some debates on learning objects nurture the imagination that it would be possible to relief teachers (or authors) from the task to decompose materials into smaller units, and that the exact description of these small sub-units with metadata would lead to an increased interoperability (WILEY, 2002), this concept does not seem practical, at least if it is assessed from the perspective of the literary metaphor. Can anybody imagine that each chapter, each paragraph, each word should be described with metadata? And can anybody imagine that a useful text can be composed out of these chunks of material, just by putting them together? These options are inappropriate for most knowledge resources.

However, there is a granularity of scholarly materials, for which a bibliographic treatment has proven to be viable and useful. Independent texts seem to have the right size for this treatment, for example articles in journals or collections, or monographs. Each independent text builds the context for its smaller subunits and components. As STICHWEH (1984) explained, after the invention of print it took quite a while, till literary forms and formats have been developed. This literary standardisation of document formats and text forms was a prerequisite for efficient forms of text distribution, of archiving, but also of quoting and systematically referring. For authors, it is easier to produce towards a given format. Standardised text formats make it easier for publishers and librarians to manage larger quantities of similar texts. And for the reader, standardised formats make it easier to navigate and locate specific information.

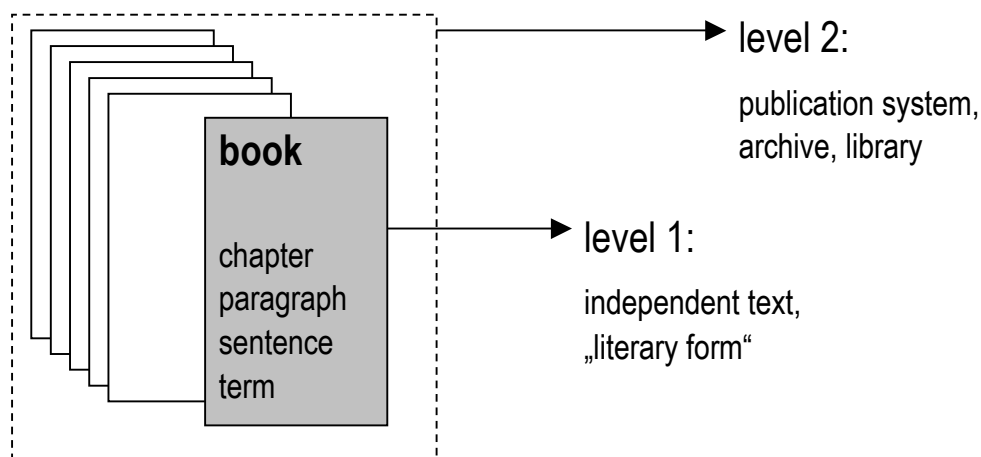


Fig. 3: Different levels for the exchange of text

## 6 Types of Repositories

These standardisations are only to a lesser extent a technical issue. To a much larger extent, they represent literary conventions that had to be developed and naturally can change throughout time. Aiming at a wider distribution of electronic educational resources, there exist similar problems and needs. It is still undecided yet, which size of materials will become common standards. However, based on existing examples I try to distinguish some possible types of repositories and respective literary formats.

### 6.1 Learning Object Collections

Specialised learning object repositories typically collect multimedia resources, which are each produced for a single learning objective, which can be regarded as self-contained and stand alone, like animations or applets. Similar to libraries for films or pictures, these repositories show a preference for a limited number of media formats, like for applets or for animations. Since these materials are very expensive, collaborative production and re-use are even more necessary than with other types of resources.

One example of a learning objects repository is provided by UCEL (Universities' Collaboration in eLearning<sup>3</sup>), which was founded by six universities in the UK. UCEL is focusing on reusable multimedia resources (mainly interactive animations) for health-professional education, which contain presentations, activities, self-assessments and further links. Another example is Mathe Online<sup>4</sup> at University of Vienna, which started as a collection of interactive applets for education in mathematics, e.g. dynamic diagrams, puzzles, tests and other interactive online tools.

<sup>3</sup> UCEL (Universities' Collaboration in eLearning): <http://www.ucel.ac.uk/>,  
<http://www.ucel.ac.uk/rlos/Default.html>

<sup>4</sup> Mathe Online: <http://www.mathe-online.at/>, <http://www.mathe-online.at/galerie.html>

## 6.2 Course Collections

Another literary form is the course as an independent entity for publication and reuse. A course normally can have more than one learning objective and can comprise a variety of smaller object and of various media formats. Courses should contain syllabus, calendar, materials and reading lists, as well as instructions, assignments and tests.

Maybe the most prominent example for a course collection is MIT's OpenCourseWare initiative<sup>5</sup>. Having started in 2001, MIT in the meantime has published materials from more than 1.250 courses. These materials can be regarded as post-teaching publications, since they are extended descriptions and enriched by-products of their regular courses, which are published after the courses were finished. Different to that, Learn@WU<sup>6</sup>, a project at the Vienna University of Economics, provides a course repository directly aiming to support residential education of their students. This repository is accessible for all members of the university, but not open to the general public. Yet another approach is taken by the Open Learning Initiative<sup>7</sup> at Carnegie Mellon, creating materials for full online courses, which even could substitute residential teaching.

## 6.3 Generic Collections

Generic collections try to cover different literary formats of learning materials in one repository. To a certain extent, they can be regarded as a mixture or learning object repositories and course repositories.

A very ambitious example for this is the Connexions project<sup>8</sup>, which defines two different types of formats, modules and courses. Modules can be regarded as small "knowledge chunks", which are produced with a special authoring tool and stored in a common repository. With the help of a course composer, these modules can be assembled to entire courses.

Another type of generic collection are brokerage platforms, like Merlot<sup>9</sup> or Educanext<sup>10</sup>. In both cases, these brokerage platforms collect (meta-descriptions of) learning materials from various sites. Due to their basic concept, they have to cover materials of different technical, didactical and literary formats, which results in very complex typologies.

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<sup>5</sup> MIT OpenCourseWare: <http://ocw.mit.edu/>

<sup>6</sup> Learn@WU: <https://learn.wu-wien.ac.at/>

<sup>7</sup> Open Learning Initiative, Carnegie Mellon: <http://www.cmu.edu/oli/>

<sup>8</sup> Connexions, Rice University: <http://cnx.org/>

<sup>9</sup> Merlot (Multimedia and Educational Resource for Learning and Online Teaching): <http://www.merlot.org/>

<sup>10</sup> The EducaNext Portal for Learning Resources: <http://www.educanext.org/>

## 6.4 Lexicons

As lexicons I here refer to educational resources, which are composed of large numbers of very small text parts, which are highly integrated and interconnected, similar to the small text units of a lexicon or an encyclopaedia. Hypertext networks could be another way to name these resources, since their individual texts can not be regarded as independent. They can not only be used in one, linear, but in a variety of different ways.

Examples for this are Pastperfect<sup>11</sup> and Geschichte Online<sup>12</sup>, both produced at the University of Vienna. Pastperfect is focusing on the Renaissance and the Reformation period in Europe, while Geschichte Online deals with questions of scientific work, literature research and didactics in the field of history.

## 6.5 Collections of Scholarly Publications

Last but not least it is necessary to mention collections of scholarly publications as crucial educational resources. These can be university libraries, but also online journals, working paper series or electronic collections of monographs. In most of the mentioned cases, literary formats and the respective types of collections already are well established.

# 7 Opening Access to Educational Resources

What can educators and universities practically do to open access to their resources? We have not only seen differences with respect to literary forms of materials and their respective repositories, but also with respect to the sophistication of materials and to the related amount of editorial investments. Especially cases like UCEL or the Open Learning Initiative represent expensive, high end developments, which are very impressive, but neither necessary nor feasible for most educators and universities. To create a common sense of sharing, it seems rather more appropriate to develop options, which have a lower entrance level for a broader community of producers, who in most cases still are individual educators. Logistically, there are different ways imaginable to achieve this goal.

## 7.1 Open Courses

Technically the simplest way is to make course descriptions and all materials used for a course public. This can be done by setting up individual course homepages or by opening courses in learning management systems to the public. A problem might be that this concept does not allow to share sensitive (e.g. licensed, premature or confidential) materials or to protect sensitive interaction among the participants of a course.

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<sup>11</sup> Pastperfect (Die Geschichte Europas zwischen 1492 und 1558): <http://pastperfect.at/>

<sup>12</sup> Geschichte Online: <http://gonline.univie.ac.at/>

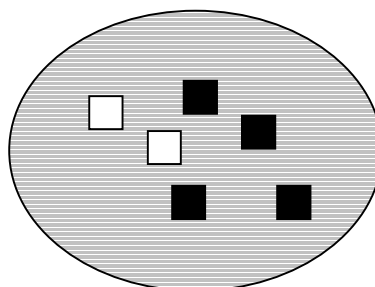


Fig. 4: Open course

## 7.2 Partly Open Courses

A different way to organise the publication on an individual level is to discriminate between publishable and restricted or confidential materials within one course by creating a public and a restricted view on a course. Technically this requires scalable access-rights and/or the potential to create different views.

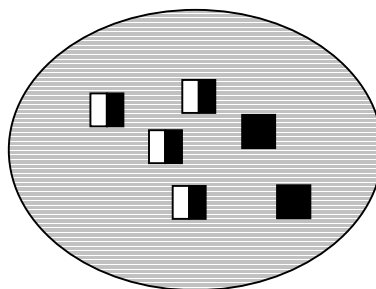


Fig. 5: Partly open course

## 7.3 Institutional Archive(s)

A third option can be the foundation of institutional archives to share and/or publish educational materials. This can provide a bigger, more prominent stage for the distribution of materials than individual courses or homepages. However, institutional archives need centralised (technical, editorial, meta-data) maintenance and may require a duplication of materials (from the individual course into the institutional archive).

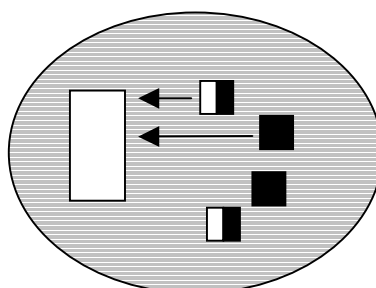


Fig. 6: Institutional archive

## 7.4 External Archives

It is also possible to set up external archives, which are used for the exchange of materials from different institutions. On top of the need for centralised maintenance, cross-institutional agreements and standards become necessary.

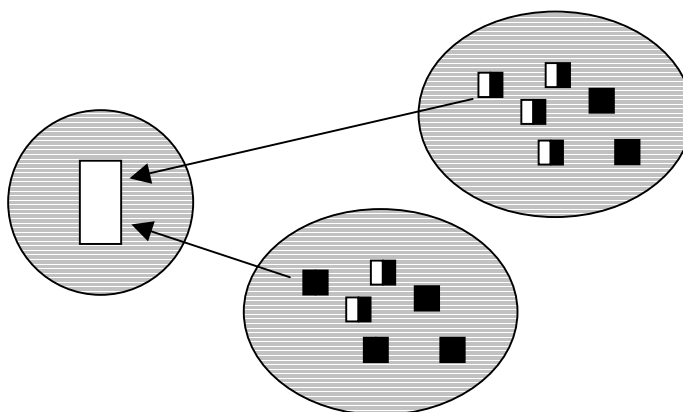


Fig. 7: External archives

## 7.5 Connecting of or harvesting across institutional archives

Yet another option for the distribution of educational materials is to connect the archives of different institutions. This could be done either by simple mutual references or, more advanced, by harvesting across various sites. Practically, it makes most sense to connect archives of the same or at least similar kind, e.g. similar OpenCourseWare sites or similar learning object repositories.

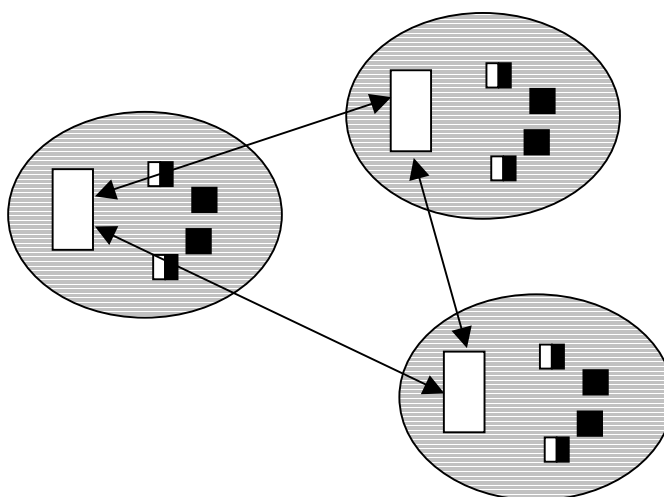


Fig. 8: Harvesting across institutional archives

## 8 Conclusions

It is obvious that learning materials and personalised interaction are complementary elements of educational arrangements. Learning materials will never substitute interaction in formal education. However, the use of ICTs is changing the shape of learning arrangements and increases the need to produce learning materials.

The conceptual distinction between courses, organisations and society helps to understand that there are several options for the distribution of electronic materials beyond the single classroom. Expanding the reach of learning materials can add value and contain costs for higher education. Additionally, this can lead to more transparency and innovation. Different contexts do not necessarily compete with each other, but also can complement each other, since they offer different levels of control and participation. Technically and logistically the scalability of access rights (both for users and producers) become necessary.

The increased distribution of learning materials reconfirms the role of educators as authors and the role of universities as publishers. It is necessary to understand that this creates a variety of new challenges. To a lesser extent, these challenges are technical ones, even if technical competences clearly help. To a larger extent, these challenges are conceptual ones, which have to do with the nature of academic knowledge resources. It seems to be most appropriate apply metaphors and comparisons with academic literature and related repositories to deal with these questions.

Given the considerations on the variety of literary formats and types of collections mentioned above, it seems to be more plausible to expect a consolidated range of literary formats than to expect a single standardised definition that comprises all forms of learning materials. As a consequence, it also seems to make more sense to plan for a consolidated range of types of repositories rather than to wait for one single universal archive.

Universities as organisations will become responsible to create and maintain institutional archives as a way to foster the distribution of electronic materials. Apart from technical requirements, they will have to provide logistical and editorial support. Instead of creating everything from the scratch, they will be well advised to join forces with peer institutions to exchange experiences and to create joint models for publication.

Last, but not least, it will be necessary to create a common sense of sharing and to educators serious as producers and consumers of educational resources. Especially, if these resources are published, they should be seen as relevant contributions to the academic portfolio of scholars. Only, if the production and publication of learning materials is addressed by academic mechanisms of acknowledgement and promotion, the provision and distribution of electronic learning materials can be sustained.

## 9 References

### 9.1 Books and Articles

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## 9.1 Online Resources

**Connexions**, Rice University: <http://cnx.org/>

**Fathom**: The Source for Online Learning: <http://www.fathom.com/>

**Geschichte Online**: <http://gonline.univie.ac.at/>

**Learn@WU**: <https://learn.wu-wien.ac.at/>

**Mathe Online**: <http://www.mathe-online.at/>, <http://www.mathe-online.at/galerie.html>

**Merlot** (Multimedia and Educational Resource for Learning and Online Teaching): <http://www.merlot.org/>

**MIT OpenCourseWare**: <http://ocw.mit.edu/>

**Open Learning Initiative**, Carnegie Mellon: <http://www.cmu.edu/oli/>

**Pastperfect** (Die Geschichte Europas zwischen 1492 und 1558): <http://pastperfect.at/>

**The EducaNext Portal** for Learning Resources: <http://www.educanext.org/>

**UCEL** (Universities' Collaboration in eLearning): <http://www.ucel.ac.uk/>, <http://www.ucel.ac.uk/rlos/Default.html>

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