# Collaborative content manipulation: an e-Learning approach

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## Abstract

Within the Atlantis University there are new ideas and concepts of using e-learning platforms which are not yet supported by any others. Therefore a new platform has to be developed. The extended blended learning concept and paradigms of web 2.0, open source and knowledge management created the basics of a concept for a new generation e-learning platform. This article describes its ideas, functionality and first steps of a prototypical implementation.

## Keywords

E-learning, Collaborative, Learner Preferences, Concept, Extended Blended Learning

## 1. Introduction to the New E-Learning Approach

This paper describes a new approach to e-learning activities. Therefore paradigms which should support students in their natural learning activities were defined e.g. searching information, reading information and sharing them with others. The next step is to find technical solutions to implement these paradigms. A first recommendation is the concept of "Collaborative Content Manipulation" (CCM). It allows students to collectively develop e-learning content based on the Web 2.0 idea. Especially the development of PowerPoint-like presentation-styles is focused here. A fully functional prototype for CCM was developed and set up for first e-learning-experiences.

The environment in which this new e-learning approach was developed is the Atlantis University. It is a highly motivated project in the spite of finding new ways of education. Its goal is to grow into a learning platform which supports the extended blended learning-concept developed at the University of Applied Sciences in Darmstadt (Bleimann, 2004; Bleimann and Röll, 2006a, 2006b). Within this Concept three learning types are combined into one methodology*: face-to-face learning* as the personal type is used to introduce the learning content by a teacher or a professor and to answer questions or amendments; *e-learning* as the self motivating type supports the main content for learning via a web-based interface and finally *project based learning* as the practical part identifies projects to be solved by the students using

their new gained knowledge. An appropriate usage *of* these three pillars makes the work between students and teacher more intensive and prepares students best for life long learning activities (Röll, F.J., 2003).

"***[E]xtended blended learning*** *[is] used to describe the integration of electronic learning (e-l), face-to-face learning (f2f-l) and project based learning (pro-l)*" (Bleimann, 2006 : 2).

In this section we emphasis the e-l part of the concept and its necessity to design a new approach on implementing an e-learning platform.

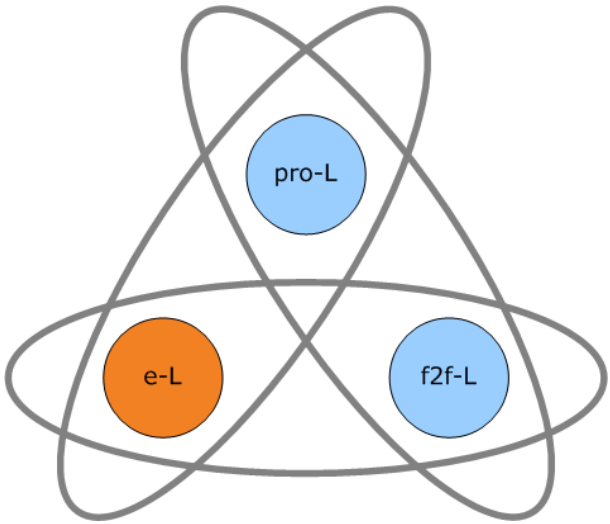


**Figure 1: Three components of extended blended learning (Bleimann, 2006)**

"*Using a learning platform (e-l) the basic knowledge is made available in a course or hypertext system"* (Bleimann, 2006 : 4). E-l raises the student's opportunity to independently organize their working time and allows them to learn at their own speed. Teachers have the advantage of easily distributing new information to the students. Disadvantages of e-l are the intensive needs for resources like time, budget and tutoring. Furthermore technology and costs cause problems and finally there is no immediate application and reaction to the new learned content like there is in f2f or pro-l. Advantages and disadvantages of e-l are listed in table 1.

| | Advantages | Disadvantages |
|---|---|---|
| **e-l** | learning any time, any location | resource intensive (time, budget, tutoring) |
| | active learning at own speed | content mistakes are more serious |
| | easier quality control | technology problems |
| | easy distribution | costs for students |
| | | not immediately applicable |
| | | no intermmediate answers |

**Table 1: Advantages and disadvantages of e-learning (Bleimann, 2004)**

A lot of e-learning platforms already exist. They are more or less useful and enhanced in development. Within these platforms different standards (e.g. SCORM, LD) and learning management systems (LMS) already are implemented. Nevertheless e-learning platforms are still at the beginning of their lifecycle. The experience in the Atlantis University made it necessary to reconsider the overall concept of e-learning platforms. Some disadvantages should be handled and certain paradigms known from *web 2.0, open source* and *knowledge management* could be involved in new platform approaches. Therefore the next section introduces some new paradigms, ideas and approaches for developing a new e-learning platform. The implementation of a prototype already started in summer 2006 and it is still being enhanced.

## 2. Our New Approach

Inspired by the idea of extended blended learning a technical concept for e-learning platforms was designed. Therefore the evaluation of the students learning process was essential. The following six process steps were identified (Pieke, 2006):

- search information
- structure information
- select information
- read and evaluate information
- summarize the information
- share and discuss the new information with other people

The technical concept should support these six process steps but it should not force any chronology within them. This keeps a maximum flexibility. As a consequence intuitive learning activities are possible (Pieke, 2006). Some indispensable paradigms form the basis of the new platform and their notice is essential (Pieke, 2006):

- find and structure existing knowledge
- adapt knowledge to different styles and media (e.g. sound, video, text, pictures)
- inform about new knowledge
- reach relevant knowledge in a fast and flexible manner
- encourage students in their learning process
- benchmark all information
- use the benchmark in combination with the learning preference concept of Prof. Dr. F. J. Röll to individually regulate priorities, presentation and arrangement of learning content
- identify appreciable knowledge
- develop, use and discuss knowledge in its respective context
- teachers as moderator help to support students
- develop and summarize content in a group as in the *Open Source* idea

The following section describes the basic idea of the technical e-learning platform-concept (Pieke, 2006):

The entrance to the system is represented in a topic map. It assists students in getting an overall view of the handled topic. To reach detailed information one could drill further into each topic and even use searching functionalities to find detailed information. Search-results could be internal and external information, e.g. from Google, Wikipedia or other sources.

Content of the platform could consist of text, voice annotations or animations (practically every type of content a web-browser could handle). Each part of content owns some metadata about e.g. its author, source, quality, function etc. This has the advantage that students could rate and understand the content easily.

Students as well as teachers have the possibility of editing all kinds of content collectively. Therefore it is possible to improve and develop existing content and elevate interaction between students and teachers and even help improving not only content-quality but also content-quantity. The concept motivates passive learners to discuss the content within a group - communication itself is one of the most efficient ways of learning (Röll, 2003). Next to the learning activities, students could make personal notes for keeping ideas and insights in mind. In addition papers for test-preparation could be shared between students. And teachers could design tasks and homework for practicing. A special benchmarking-mechanism uses each student's opinion of quality and relevance concerning any content. In combination with each students learning type preference, content could be edited and presented individually.

Students could also select to be briefed about certain content-changes by using RSS-Feeds. Lots of additional features supporting the learning and teaching activities could additionally be thought of. For example an analytical system could monitor the student's activities and support the teacher in assigning marks. Or for instance another system could be a dictionary that describes foreign words in place.

The next section shortly describes the detailed possible solution for the six essential process steps during learning activities.

**Search Information**
Searching information is supported by algorithms handling all inserted content. Because there is no possibility to ever include all information about any topic into the system it is necessary to also use external knowledge sources (e.g. Wikipedia, Google, Webopedia, Wissen.de, Duden.de, etc.). The aim is to keep the student bound to the e-learning platform but nevertheless to include external sources to improve the systems benefit. For better results additional search-filters and sorting-functionalities are recommended.

**Structure the Information**
The topic map is one of the used tools to structure content. It shows dependencies and connections between topics even better than indexes do. Topics and content could also be brought into a chronology. This helps students to understand

connections within the content and supports a flexible and logical way of learning. Furthermore parts of content could be connected with each other. For example a picture could be connected with an mp3-audio-file that contains additional voice annotations.

In addition meta-data improves the possibility of structuring content according to e.g. quality, relevance, date of change, etc.

**Select Information**
Students get the possibility of selecting content and bookmark it in a personal list. They then could learn the marked content later on, maybe add questions or discuss it with other students. A second way of selecting information could be done through benchmarking. Each student assesses the content about its quality and relevance. According to their learner preference types, information is selected and arranged individually. On top of this teachers could change and select displayed content to achieve their didactical aims in all circumstances.

**Read and Evaluate Information**
Reading and evaluating content like texts, voice annotations, pictures, animations etc. should be easily be handled by students. It even is possible to use content-types multimodal and simultaneously e.g. play voice annotations while displaying a picture. This improves the possibility of transporting information to different types of learner preferences.

**Summarize Information**
Students soften make notes, mind maps or formula-papers to prepare for tests. Often they keep them to themselves or only share them in small learning groups. The main idea of the concept is to share this prepared information within the whole lesson-group and therefore support each other in preparing for tests.

**Share and Discuss New Information within the Group**
One could say that real learning only takes place when people talk about topics. If students communicate, discuss or question something there is a high flow of knowledge. Therefore the possibility of wiki- and forum-like technologies is recommended for trading and sharing information. Stating questions, adding new content and correcting mistakes allows every student to participate in the learning-process.

Essential for this is the motivation through the teacher. He needs to encourage the students to actively take part in developing knowledge. This could be achieved by making up tasks for the students or giving marks on e-learning activities.

A prototype for supporting the six process steps is being developed at the University of Applied Sciences in Darmstadt. One special idea to support the mentioned paradigms is the CCM. It supports the development and enhancement of knowledge throughout the internet in a group of students and teachers and is explained in the next section.

## 3. CCM - a New Kind of Developing Content

Creating content fitting to a group of learners is difficult and requires a lot of work. An additional problem is planning the budget for content-creation because resources often only are available at the beginning of a module. Afterwards update-work has to be realized in the teacher's leisure time. This bears high additional effort in the today's fast evolving technical subjects. Therefore content creation and content development was the first choice of being implemented in the new e-learning platform. It addresses the following paradigms known from section 2:

- encourage students in their learning process
- develop, use and discuss knowledge in its respective context
- teachers as moderator help to support students
- develop and summarize content in a group as in the *Open Source* idea

One way of improving the learning-progress of students is their motivation to actively participate in developing and improving learning content. While they devote themselves to the topic they solidify their knowledge.

The main idea of learning via an e-learning platform consists of a teacher uploading his lesson's content (e.g. formatted as Microsoft PowerPoint (PP)-slides). The platform then offers the possibility for students, as well as teachers, to add alterations to any part of the uploaded content. It is essential to place this functionality into the content itself. For this intent an integrated editor could be used to allow content manipulation right in place.
Each alternation is monitored and stored as a new version and put in direct relation to its original content. For this purpose tabs which contain each new version are displayed behind the original content. Now the teacher could check the new versions and maybe decide to release the contributed content alteration and replace the origin. This technique allows students to accumulate and alter content like known from wiki-systems. Additionally a history-functionality allows comprehending the improvement of the originally released content.

This CCM-functionality helps students to take part in the process of creating and updating content for a lesson. It helps to reduce the work-overload of teachers and additionally bring content up-to-date. The subsequent lesson could then profit from the former work that has been done and start at a higher quality-level of content. This realizes the paradigm to develop and summarize content in a Group as in the *Open Source* idea. Students could be motivated through the possibility of producing knowledge that on the one hand supports their own progress of learning and on the other hand supports their student-colleagues through improved content quantity and quality. During all of this learning process the teacher takes the role of a moderator and supports the students from a birds eye view. Therefore it could also be possible to create hole new fields of knowledge or themes of lessons through the different ideas and perspectives students could have.

Content could be represented in different types (e.g. text, audio, video). One type to represent content for lectures are PP-slide sets. Students are used to apply this

technique for their studies and it is also capable of structuring content easily (e.g. lists with a step-by-step animation). These are reasons, why the transportation of content within the new platform should support PP-like slide sets. The challenge is to transfer the PP-idea into a web based environment so it will be accessible independent of time and place. The following demands are supported by the implementation of this approach:

- a web-capable content file format (offering PP-like presentation possibilities)
- presentation-methods for web based slide functionalities (e.g. dynamically showing up items)
- an in-place-editor
- a tab-style arrangement of slide alterations
- user-management with authentication and authorization functionalities (e.g. to distinct between students and teachers)

In the following subsection the implementation of these CCM-demands is introduced in a prototypical system.

### 3.1. Realization of the Approach

The prototype is based on three-tier architecture. Its data layer is implemented in a MySQL-database, holding all content and user information. The functionalities and web-user-interface are programmed in a combination of HTML, JavaScript and PHP. Its runtime environment is Xampp, which is a distribution of an Apache web- server, combined with packages for MySQL, PHP and Perl. It is platform-independent and runs on various operation systems like Windows, Linux and Mac OS X. Platform-independency was one of the basic reasons to develop the new e-learning environment using an Apache web-server (Apache Friends, 2007).

The first step to the e-learning environment was a prototypical implementation of the overall concept-basics (Pieke, 2006). These form the basics for future development. It is possible to show two different representation-types of content in a combined view. Figure 3 shows a screenshot of the website, presenting a video in the upper frame and a test in the lower frame.

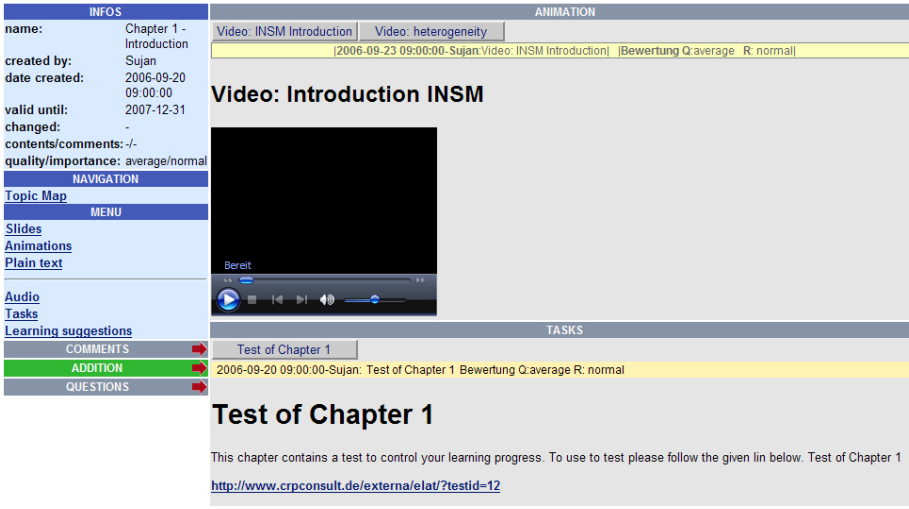


**Figure 6: Presentation of two Content Types within the prototype**

To find a PP-like way to present content in a web based way some different formats were encountered (Russell, 2007:55). It was decided to use the file format “Simple Standards-Based Slide Show System” (S5) designed by E. Meyer (Meyer, 2007). This slide-show-format is based on XHTML, CSS, and JavaScript. Its construction is “very simple, highly semantic and completely accessible” (Meyer, 2007). Because of its basic use of HTML and XHTML open source WYSIWYG-editors can be used to adjust them to the needs of the new platform. S5 is also based on standards which remove the necessity to make use of proprietary programs.

By using Cascading Style Sheets (CSS) within the S5 format it is even possible to design templates. This technique could be compromised with the use of master-slides within Microsoft PP. The S5-format fits all needs of the new platform. Furthermore its technical-description is open source and therefore it is accessible and could easily be adapted to the platform.

The standard construction of a S5 file is depicted in figure 4. The complete content of a slide set is contained in a single HTML-file. Within this file each slide is marked by an ID. The routines to include navigation-controls, slide show functionalities and other JavaScript routines are stored in external JavaScript files on the web server. Summarized one could say JavaScript handles all dynamic aspects of the slide show. The layout of the slides is handled by the contained CSS files.

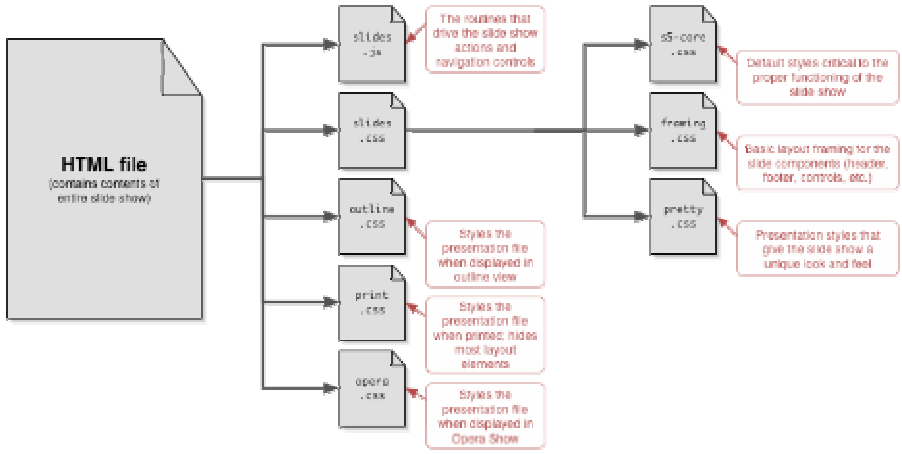


**Figure 4: S5 File Structure (Meyer, 2007)**

To fit into the e-learning concept the S5 file-format had to be modified. Whenever the teacher releases a new slide he should be able to replace a single slide within a slide set. Furthermore every version of a slide set should be restorable by using the history-functionality. Therefore the S5 slide set was split into several files, each containing a single slide. The slideshow routines of S5 were kept but the navigation between slides needed to be removed. This did not have any negative affect because the platform already provides this functionality.

The decision of splitting the file into parts simplified the implementation of history-functionalities. Now each single slide could be stored within a database. If a new slide is inserted, the old one gets marked as replaced and therefore is still available for versioning. The order between slides is managed through IDs which are automatically assigned by the platform.

At the moment each content file is stored in a database. In an advanced state of the prototype a Document Management System (DMS) could be used to store and manage these content-files in the platform.

Figure  shows a screenshot of a simple demo slide integrated in the platform. The small buttons above the slide can be used to navigate in-between all the slides of a slide set.


**Figure 5: Screenshot of a S5 slide within the platform**

For content manipulation the used WYSIWYG-editor had to be completely web based, open source and offer possibilities to be adapted to the new platform. The TinyMCE editor from Moxiecode systems (Moxiecode, 2007) fitted these demands. It is developed in JavaScript and therefore enables an easy way to be integrated with the S5 format which also uses JavaScript. Furthermore the TinyMCE editor is developed modular and therefore allows an implementation of S5 specific functionalities in the future. These functionalities could be used to e.g. assign special slide show routines to text and images. The editor is appealed by clicking the edit button at the frame's bottom. This content of the slide is then used as an editable template and could be edited by the user (Figure 6).

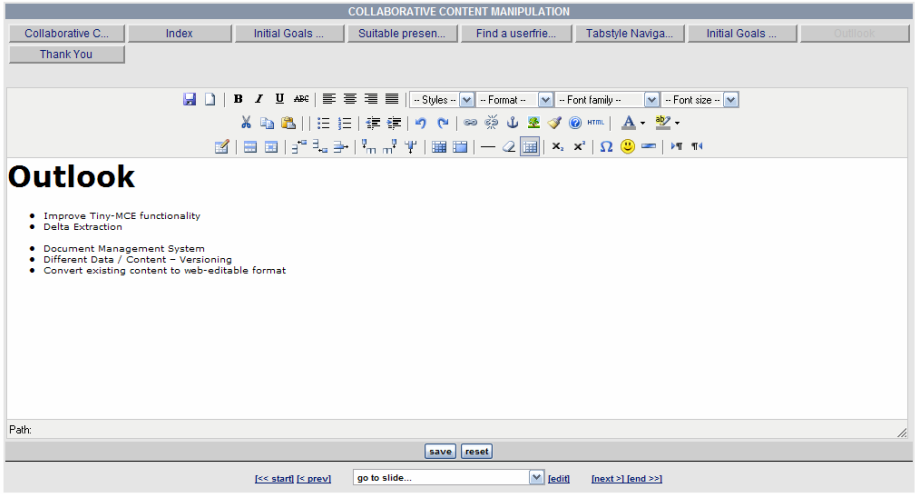


**Figure 6: Screenshot of the TinyMCE Editor integrated into the Platform**

To save the changes in the slide the system automatically stores it into a new tab behind the original slide. The number of existing alterations of each slide is represented by the number of tabs. The teacher could then decide to release one of the alterations as the new original slide. The old slide then is removed and can only be retracted by using the history functionality. An additional feature could be an e-mail-notification of teachers whenever a new alteration is created by a student. Figure 7 shows the correction of the content as the first alteration of a slide.

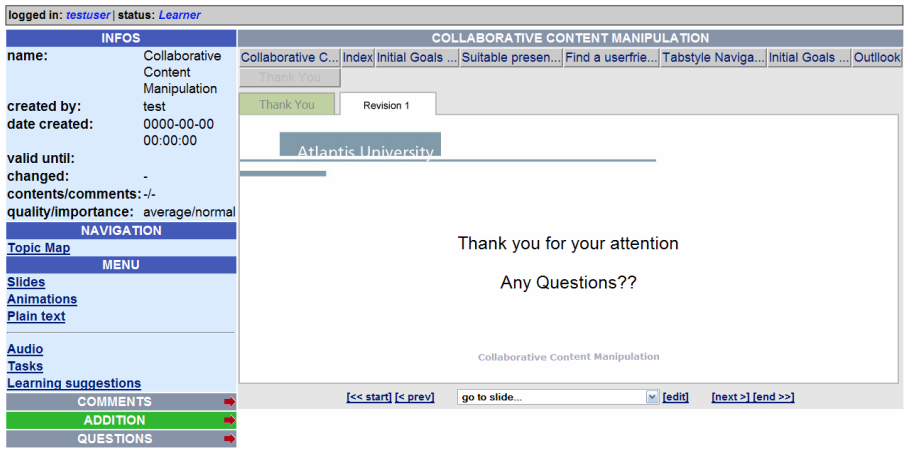


**Figure 7: Alternative Slide presented in the PlatformConclusion**

By developing a new e-learning-platform to support the extended blended learning concept a first step to the overall concept is made. The first experiences with the CCM-website show great responses and a new view of learning. But there is still a long journey to reach an overall platform-solution. Additionally different representation-types of content (e.g. audio, pictures and videos) should also be editable in a CCM-manner. A first approach to enable the collaborative manipulation of pictures could be realized by using Ajax technology (Open Jacob, 2007). It presents an open JavaScript library that allows the creation of diagrams and drawings in a web based manner.

## 4. References

Apache Friends (2007), “Xampp introduction”, http://www.apachefriends.org/en/xampp.html, (Accessed 16 April 2007)

Bleimann, U. (2004), “Atlantis University - A New Pedagogical Approach Beyond E-Learning”, Campus-Wide Information Systems, Vol. 21 No. 5, 2004, 91-195

Bleimann, U.; Röll, F. J. (2006), “Extended Blended Learning”, In Querschnitt (Beiträge aus Forschung und Entwicklung der Hochschule Darmstadt) No 20, March 2006, 140-149

Bleimann, U.; Röll, F. J. (2006), “Extended Blended Learning – Innovative Learning Scenarios for Universities”, In INC 2006 Conference Proceedings, ed. by S. Furnell and P. Dowland, Plymouth 2006, 385-392

Meyer, E. (2007), “S5: A Simple Standards-Based Slide Show System”, http://meyerweb.com/eric/tools/s5/, (Accessed 17 April 2007)

Moxiecode systems (2007), “What is TinyMCE?”, http://tinymce.moxiecode.com/, (Accessed 17 April 2007)

Open Jacob (2007), “*Open - jACOB Draw2D* - Ajax Diagrams that just works”, http://www.openjacob.org/draw2d.html, (Accessed 10 April 2007)

Pieke, M. (2006), „Konzept des User Interfaces der ATLANTIS University Platform“, Research paper, University of Applied Sciences, Darmstadt.

Röll, F.J. (2003), *Pädagogik der Navigation*, Kopaed, Munich

Russell, C. (2007), “Collaborative Content Manipulation – Concept and Prototypical Realization”, Master thesis, University of Applied Sciences, Darmstadt.