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Platform-independent KML Editor for Creating E-Learning Modules based on XML

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Abstract: The chair of Operating Systems of Chemnitz University of Technology participated in a joint project “Knowledge Workshop Computing Systems”. As a result, twelve universities across Germany created a total of 145 e-learning modules for the subject of Technical Computer Science. Experiences from this project – in terms of creation of modules based on XML as well as from use in presence teaching at schools – initiated a second project creating a WYSIWIG editor based on the idea of Mr. Volker Fickert, a member of the chair. It also allowed teachers creating learning modules who are not skilled in using XML directly. Experiences from the first project were published in [3]. This paper presents the WYSIWIG editor KML which has been implemented in Java. The editor uses a special markup language named <ML>³. The paper presents experiences from using this editor for creating e-learning content in schools, colleges and professional schools in the Federal State of Saxony in Germany.

Introduction

Electronic media had been in use in teaching already in the early 1960's. Since then, the topic “schools and new electronic media” has been playing an increasingly important role in teaching and also in scientific discussion. The idea of using electronic media in schools and teaching has recently become more pervasive with the ever increasing influence of information and communication technology in professional and private life. Current problems in using electronic media in schools and for teaching – which is also called e-learning – can be summarized by following thesis:

- E-learning does not replace the teacher in schools, teaching and training.
- E-learning requires prerequisites which are not a priori given. The current situation is characterized by a number of often uncoordinated initiatives for creating and using components of e-learning. Repeated creation is typical, re-use rather rare for content that is made publicly available. Another counter weight for the increasing need in use of new media is the often present lack of prerequisites in terms of resources (hardware and appropriate software) as well as skills of staff. We observed a high need for special training for teachers as well as authors of e-learning content.
- Creation of complex e-learning materials, alike other teaching material such as books or experimental sets should not be the primary concern of teachers, and should specifically not be done “on the side”. E-learning offerings should be created by professionally skilled and dedicated personnel. It also includes cooperation with teachers as well as with users of e-learning content and students as final consumers of it. But teacher should get the possibility to create and to modify e-learning modules with their knowledge.

The project succeeding the prior WWR project for creating the KLM Editor is based on these three thesis. Thesis 1 states that e-learning does not replace teachers and instructors in schools and universities. For further discussion, we limit the scope of discussion to the use of electronic media in presence teaching and what is called blended learning, which is understood as the merging between presence and virtual (guided by e-learning) phases.

Using e-learning for bounded learning units also requires a Learning Management System (LMS). Such a system is optional for blended learning. Creation of complex learning systems and modules should be the matter of specialists. Creation of methodical and didactic (partial) modules for selected units or for

purposes of customization should also be possible for teachers and instructors (also under consultation with students). Creation of tools however, is the matter of specialists.

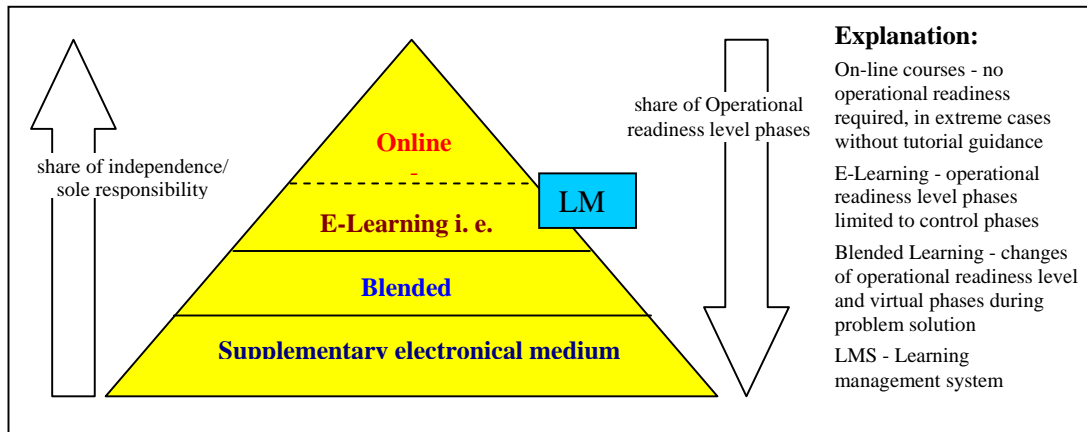


Fig. 1: Extended view on e-learning (e-learning Pyramid).

Development of KML Based on the Markup Language <ML>³

It is good practice separating content from layout and didactic goals when electronic media, specifically multi media content, should be usable in a flexible manner for knowledge presentation and transfer to students. The web language HTML does not allow for this separation. It is thus recommended using the markup language XML [1], which provides the appropriate formats for defining structure as well as for content. We developed a three-dimensional model to represent the fundamental separation between content, layout and didactic goals. This model provided the basis for a defining a special XML dialect that had been developed in the prior WWR project which is called Multimedia Learning Objects and Modular Lectures Markup Language (<ML>³).

Fig. 2 shows the three dimensions along which <ML>³ has been defined. Based on the target audience (target), output format (device) and required skill level (intensity) can be chosen. Modules can be marked and assembled on the fly in a logical and didactic structure based on meta information which was included in modules.

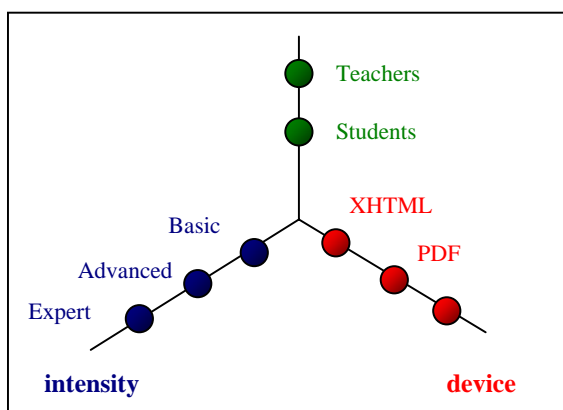


Fig. 2: Three-dimensional base model.

Teachers and instructors can create customized learning content based on existing learning modules, target audience and skill level. Content can be provided and consumed in a web-suitable format. In addition, powerpoint presentations with examples and solutions to tasks can be generated by defining instructors as target audience.

This modular principle is not visible to consumers (students) and is enabled by the meta information used to combine modules from a larger number of base modules and other multi-media content such as texts, graphics, animations and simulations in appropriate manner. Logically associated modules can be structured and classified in a didactic sequence. They can be presented as algorithms, definitions, examples, or hints, each clearly marked and presented in a well-defined layout. Separation of logical didactic structure also allows creation of differentiated content based on pedagogic-didactic goals without actually changing the base content.

In the scope of the prior WWR project, creation of contents was done by creating XML files. It was assisted by the commercial software XMLSpy. Authors were required to understand and master the syntax of <ML>³ at a detailed level. This caused long up front training efforts, specifically for non-computer skilled personnel and often turned out to be unacceptable. Cost for the commercial software had also to be considered. The KML editor has been developed addressing these two issues.

The KML Editor

The simplest method for creating multi-medial learning content is in creating HTML files which include pictures, videos, animations and simulations into textual content. Java applets are a popular technology for integrating multi-medial content into HTML pages. It requires expertise from authors even when professional HTML editors are being used. In addition, HTML editors are not designed for creating learning content. Didactic guidance and methodical structure are not a priori supported by those editors and must be complemented by author competency. This naturally reduces successful authorship to the circle of trained and experienced authors. It also causes an increased effort in training and preparation for teachers and instructors in schools, who also need to assist their non-computer skilled colleagues in preparing their learning contents. Another disadvantage in using HTML editors is that the above discussed separation between content, layout and didactic cannot be achieved easily. Duplicate development of content is thus common place when using HTML editors for creating e-learning content.

In order to provide teachers and instructors at schools and universities with equal opportunities in creating learning content, a subset of the markup language <ML>³ has been implemented in XML, in a language named KML (Knowledge Management Language). XML files created by the associated KML WYSIWIG editor can directly be converted into <ML>³ preserving all advantages of <ML>³. Conversion and presentation tools developed in the prior WWR project have been integrated into the editor in a way that allows combining content on the fly in the desired output media format “by pressing a button” without requiring further background knowledge.

Fig. 3 shows the elements of modules structured in a logical and didactic manner. The implemented <ML>³ dialect includes a component selection that is specifically relevant for schools.

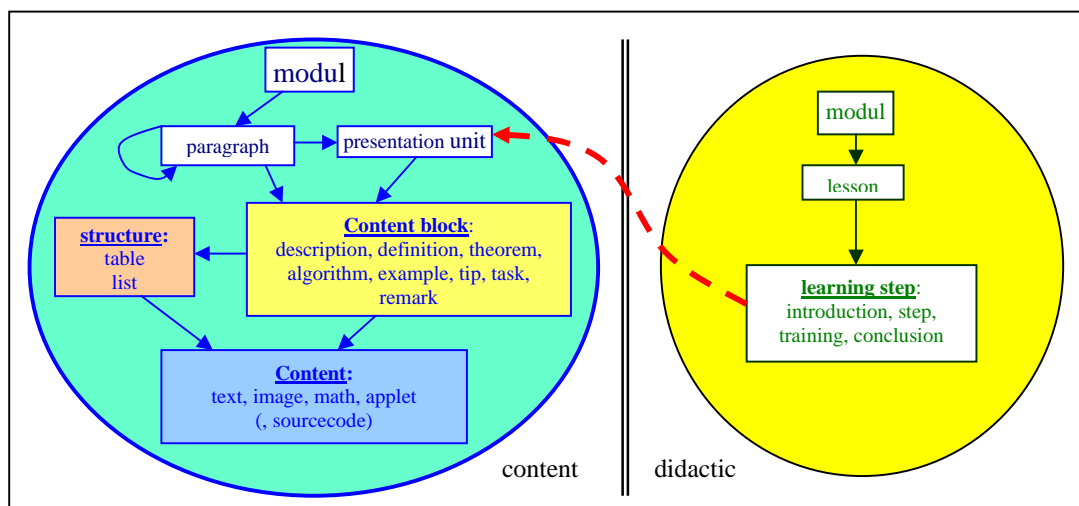


Fig. 3: Logical and didactic structure of modules for KML.

The KLM editor provides the components shown in figure 3 for supporting logical and didactic structure or e-learning content. The objects shown under “structure” are the ones known from traditional text processors: list and table. There are also content objects: text, image, math, and applet, which can be complemented by source code for computational modules. All objects are combined in so called content blocks for achieving common layout. Content blocks can be structured as simple paragraphs (descriptions), definitions, theorems, algorithms, examples, hints, tasks or remarks. These object groups can be marked with certain properties. Tasks, for instance, can be multiple-choice tasks or essay tasks. The <ML>³ syntax allows expressing that answers should be sent to the teacher or instructor via email. Other properties follow the three-dimensional base model. Tasks level, output format and target audience can be formulated as well.

Use in Practice

Fig. 4 shows a screen shot of the editor. The editor has been implemented and tested. Starting in spring 2005, the editor will be used in two case studies for creating e-learning content in schools in Saxony/Germany. The goal of these case studies is usability validation and gathering experience and feedback from users of the editor. A longer-term goal is the creation of a central collection of learning modules for various subjects and types of schools. This collection then allows teachers and instructors to become authors of modules as well as their customers. They will have the opportunity to create new modules as well as modify and customize existing modules and combine courses from learning modules.

The two case studies are in particular:

- Practical exercise “Innovation at Professional School”: Use of the KLM editor and development of e-learning modules for subjects electronics, computer science, computer systems, and information processing (as blended learning in combination with supplementary course material).
- Practical exercise ELeaS (E-Learning in Sportgymnasien, E-Learning in Sport Colleges): The KLM editor is used for creating e-learning course material in subjects of Mathematics, German language, English language and History. In addition, learning modules will be integrated into existing web environments WebCT and BSCL (for blended learning).

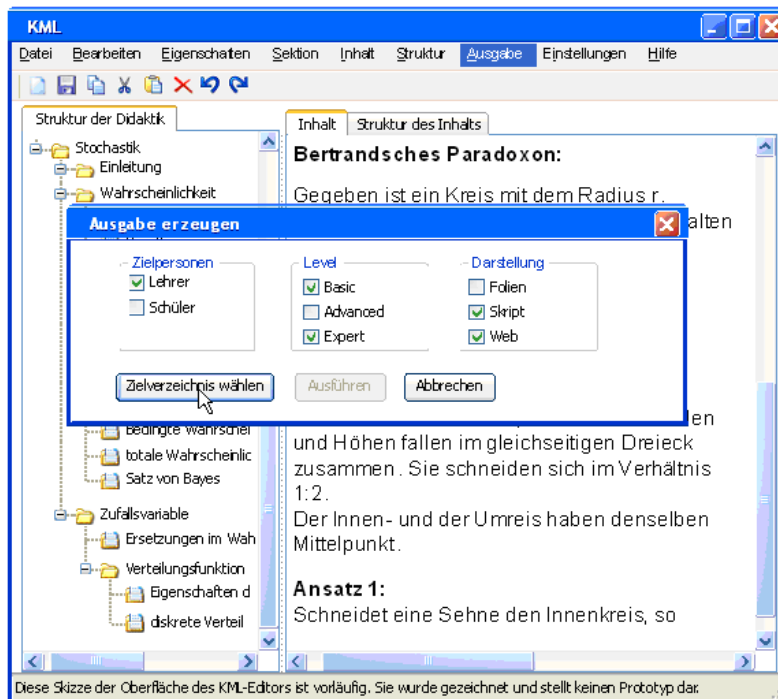


Fig. 4: Screen surface of the KML editor.

Goal in both projects is the scientific investigation of following thesis:

- E-learning can only be complementary to presence teaching in schools. It cannot substitute it.
- Use of e-learning components improves efficiency of presence teaching.
- E-learning allows reducing the number of hours spent in individual subjects releasing time for self-guided learning, practicing and e-learning.
- E-learning fosters the use of new media, primarily guided by didactic content rather than for self-purpose.
- E-learning simplifies interdisciplinary teaching.
- E-learning allows more detailed and higher-level teaching and experience by including students in the creation and selection of learning modules by using the simple tool box-like system. Work and learning progress can be traced. A variety of choices for project works can easier be offered and also easier be customized.

Methodically and didactically-founded use of e-learning systems in presence teaching will also pose significantly higher effort on teachers and instructors concerning course planning as well as the creation and customization of e-learning modules. Toolbox systems like the presented KML editor will support teachers and instructors with or without computer skills in their authorship roles.

Summary

Experience gained at Chemnitz University of Technology lets come to conclude that complementary use of e-learning systems in presence teaching creates a positive didactic effect. Consequently, our goal is to transfer experiences into practice in the educational system ranging from schools to universities. The main benefit in using the presented techniques is in the ability to clearly separate content from layout and didactic goals as well as a steadily increasing library or collection of modules represented in XML that can be created, reused and customized. It enables the efficient use of electronic media with the particular purpose of teaching contents presented as e-learning modules. The presented KML editor allows reducing the efforts for authoring and customizing modules and content. The editor also enables teachers and instructors with limited skills to initially select and customize learning content and gradually evolve it towards authoring content. Using the editor only requires basic knowledge in text processing. The KML editor hides the detail of the <ML>³ language. Users can easily create different content without requiring knowledge in <ML>³. Planned use of the KML editor in the two case studies will allow to further investigate the practicability, acceptance and ability to integrate into e-learning environments that may already exist in schools.

References

- [1] N. Bradley: The XML Companion. Addison-Wesley. London 2000.
- [2] IEEE: Learning Technology Standards Committee. Draft Standard for Learning Object Metadaten. New York. 2000. (<http://ltsc.ieee.org.wg12/>).
- [3] Elke Wällnitz, Volker Fickert, Winfried Kalfa: Möglichkeiten von Simulationen und virtuellen Praktika in der Präsenzlehre des Lehrgebietes Betriebssysteme durch e-Learning. In: Von e-Learning bis e-Payment: Das Internet als sicherer Marktplatz. Tagungsband LIT' 02. 26./27. September 2002. Leipzig. – Berlin: Akad. Verl.-Ges. Aka. 2002.
- [4] Lars Kornelsen, Ulrike Lucke, Djamshid Tavangarian, Denny Voigt, Matthias Waldhauer: Mehr-dimensionale Lehr- und Lerninhalte und ihre Beschreibung in der Sprache <ML>³. In: Structured eLearning: Wissenswerkstatt Rechensysteme. Tagungsband zum Workshop am 30. März 2004 in Rostock-Warnemünde.
- [5] Elke Wällnitz, Volker Fickert: Methodisch-didaktische Einsatzmöglichkeiten des WWR-Moduls „Betriebssysteme“ am Beispiel des Hauptspeichers. In: Klaus Rebenburg (Hrsg.: Grundfragen multimedialen Lehrens und Lernens. Tagungsband 2. Workshop GML² 2004. 15. bis 17. März 2004. TU Berlin.
- [6] Wissenswerkstatt Rechensysteme (<http://www.wwr-project.de>).
- [7] Markup Language <ML>³ (<http://www.ml-3.org/>).
- [8] Practical exercises ELeaS (<http://www.sn.schule.de>)

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