Recapitulation of Usage Barborka E-learning System on VŠB – Technical University of Ostrava

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ABSTRACT: *The Barborka e-learning systems design history. Latest version of the e-learning system based on internet technology. In the system is possible build and upgrade electronic resources or interactive teaching lessons. There is implemented architecture for a multi-user access with central or distribute administration. We described the work of the system from the view of the authors, tutors, and students. Also is here published experience with teaching and material design for education process at the Department of Computer Science and Regional Centre for Lifetime Education on VŠB-TUO. Material contains a recapitulation of finished modules and future development ways.*

1   HISTORY OF PROJECT BARBORKA

The teaching system called "Barborka" is being developed at VSB-TUO since 1983. At that time was designed first conception of the content and method of dividing elementary items, which remains with small changes until now.

This System includes:

- Description from the standpoint of information storing data technology;
- High level logical element building implementation;
- Auto-correcting tests result.

There was defined the theory of auto-compiling question, auto-answer potentiality, positive and negative reactions on stored answers, qualifying answer and other variants of inquiry and evaluation.

The first version of Barborka system was used for testing process. The "Barborka" system was used as a program for create, design and build/correct tests for the Department of Mathematic and Physics. There was designed large collection of questions, which helped automatically in the testing student process. The significant work in using this system was represented by voluntaries teachers, who start to use this system.

First alpha version was for "hall-computers", other one in the famous OS/MS-DOS. The Dos version has had a graphic editor for vector graphic design and storing bitmap's pictures, and could have been add into study materials. The third version was made in 1999 as a thesis. This was a local application for the OS/Microsoft Windows. Connected to this thesis were created several theories that had for final results applications, which were used as tasks generator for computer graphic and descriptive geometry teaching.

Magnificent turning point of "Barborka" was in 2002. The evolution of the IT, facilitate to show multimedia elements and progressive interoperability in Internet. It allows fully realization of all previous ideas and expands them in other directions. The analysis of current requirements for teaching system was started in Czech environment following the international standards. Idea of the System is based for full-time, distance and combined studies. The new system was presented several times in VIRTUNIV, which connect activities of three institutions for e-learning in Moravia and Silesia – University of Ostrava, VŠB-

TUO and Karvina Silesian University. New requirement for teaching system were instructed between teachers and students. Regarding to extensive suggestion of the previous program source was dividing into two parts: Authoring Tools and LMS (Learning Management System). The Authoring Tools solves the problematic for creating study materials, the contents, format feature and questions database. The LMS contents: support for students, tutors, authors, manager process study and system administrators.

This version is realized as internet application, which supports important operating systems (Windows and Linux). Substantial difference from the primitive local systems is the multi-user 'at the same time' platform.

2 ACTUAL VERSION AND OPTIONS OF BARBORKA

New version is created as internet application based on PHP with dual direction access to SQL DB. The System works under Windows and Linux platforms and also the access is available through all common internet browsers.

Authoring Tools is used for designing, formatting text and logical structure (Pic.1). If we want to create adaptive teaching lessons based on student capabilities and reactions, teaching material can not be create as single document, but should be create from particular "items". From the items we can assemble a level structure with higher logical object, pages, feedback elements, teaching lessons and courses.

Material studies are divided in several levels. The lowest level represent the components are single elements based on text, picture, animation, drawings, formulas, programs and other kind of files. Text can be added by a text editor or as a simple text. Formulas could be added as a graphic format or in post script formats. All formats will be converting to graphic representation (Pic.1).
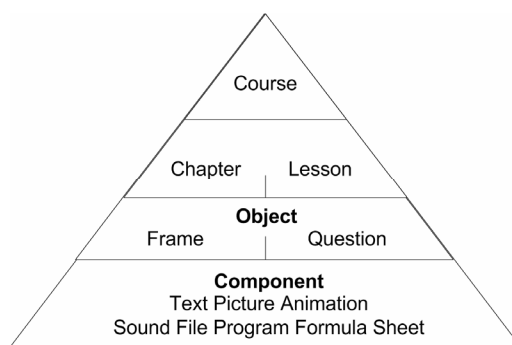

Pic1 – Pyramid

From the basic items loaded as objects are completed frames and questions. Frames are explanation an elements, generally the size for a frame is one visible page on monitor. Is possible define the order and the manner of future components that are in frames. Question is feedback validation element. Question contains series of components which are used as question definition. On frame question contains, point valuation, question type, evaluation method, complexity and enlistment. For all questions are assembled answer collections. Author can insert correct and incorrect, all possible cases for which can make some reactions. System support basic types of single or multi-choice variants. Others types are created (typed) as answers. In this case the student has to type (create) your own answer. The System support special types of answer such as number with unit, algebraic formula, answer like file, etc. etc.

The second level of system structure includes chapters or lesson forms. Chapters have simply tree structure and are typical for printing publications and study materials. In a chapter we can put sequence of frames and questions, insert the order of these objects and define their format. In contrast to lessons in this case is possible to study this material in sequence way with simply steps to previous or next object in the chapter. Lessons have usual graph structure, nodes are created from frames and questions, lines define the opportunity to pass across nodes. Student could explain through to the lines from the beginning node to the end node by common ways. The lessons are different if the answer is correct at the check. When an explanation is incomprehensible, the system puts in background the primary explication's window and formulates a new explication, with different ways and additional examples. Designing this lessons assume

huge authors experience with concrete theme explanation and common students answers. Processing and debugging these structures are much more sophisticated those chapter assembling. For lesson designing system contain Lesson Designer (Pic. 2). By the help of basic functions and visualisation methods collection designer allow fast and effectively work with lesson creating and repairing process. Author can use lesson structure generator or can assume existing structure and change contain.

Complete set of chapters or lessons represent full learning course. For authoring system are available other important tools. Course structures validate tools which validate chapters, lessons, frames, questions and components assembling. In case when is find some absence in assembling is author informed about critical error. This mean situation when is lost functionality of some element. Author gets information how to repair this problem. Author can receive recommendation about some small absence or how to improve teaching material.
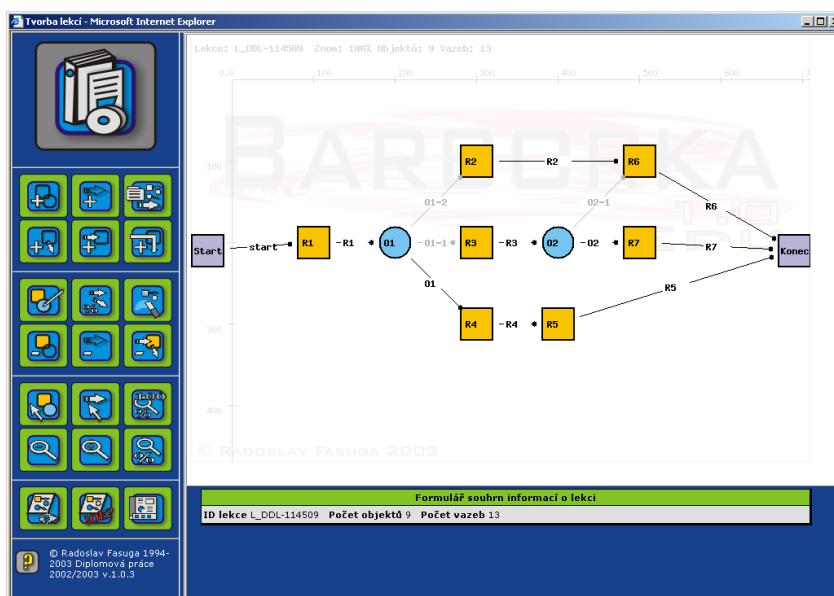
Pic.2 – Lesson designer

System allows key words definition. This serves elements connections independence on course structure. System possibly defines key words, sentences, terms, and connections to elements which contain explanation current term. For one key word can be more that one connection.

For simple elements from higher levels is possible to put icons as orientation and navigation tools in teaching text. Author can use some preset icon collection or create own icons collection. Author can switch icon collections and can effectively change course visual design.

Visual schemes are next tool for course design unification. Authoring tools allow working more authors in the same time on the same course. Every one has different style of documents rules. For visual style unification on frame, question, chapter and lesson and course level can author define visual scheme: character colour, size, font, order, buttons type and other values. This tool can be use for corporate design definition in one institution range. Visual schemes and icons cam be shared and used for not only "mother" courses for which was created.

Other section of the system is import filters. These allow fast and effective importing large contain of information into authoring tool from other existing source. For all filters is defined common structure, often is used for description XML language, which author need to adhere. Filter creates "packets" witch supply contains of current course. Filters are designed and completed based on author requirements. First expressive filter was import for graphic task generator, which import into course set of automatically generated questions, contained text and graphical components ant text based answer.

Other tool is for final course presentation called as Course export. In authoring system is possible to export course for off-line usage. Student can study at home without any special software, just with an internet browser. In the System is possible to choose several exports. The export create printable friendly version readable in PDF. Another variant present's high levels of elements dividing also the elements are

an interactive version. The exported document contain list of: chapter, lessons, searching text module, key word list etc. This variant simulates on-line teaching process support.

The course contain synchronization component is an important option of the authoring system. Also in this case exist an option for backup, restore and delete course. I the subsystem is allow course assembling from several documents. Often this function is used when more authors create their part of teaching documents separately. Courses are completed together from these parts and the duplication permit complete copy of the course to the same system with a new identification for additional changes applications witch source course protection.

System supports multi-language teaching text, such that simply elements contain information about language version, in fact in a course can coexists different language versions.

The last important section is based on information's statistic and history. Authors can see version of when the element was created and all of their changes are enrolled. Also are able to watching who from teaching team make change. Statistical information is divided in internal and external parts. Internal information describes count and changing method for particular elements in authoring tools, watching development and course correction. External statistical methods allow receiving feedback information from teaching process. Based on this information is changed course contains and structures for better improve, in detail (see section 3).
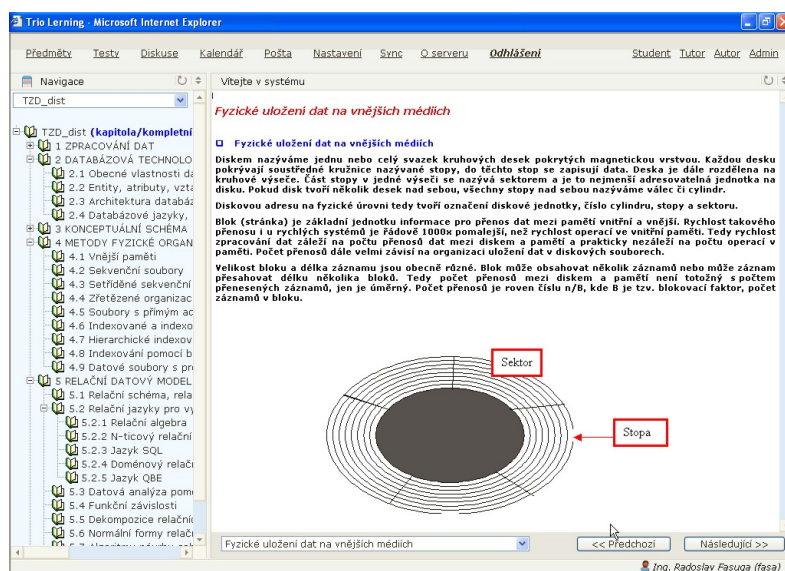
Pic3 – LMS

LMS realize teaching and controlling process, and we could explain this in three basic points of view: student, tutor and administrator (Pic. 3).

The first point is from the view of the student that provides study material presentation in defined structure. System shows frames, questions their inserting, evaluation and a GUI that helps the student to localize himself into the lesson. In this way the student know his progress during the lesson. Tutor (Consultant Teacher) could create tests from the data base. This test is useful for auto-valuation from the student. After the end of the test the student receive on screen the score.

Second is from the view of the tutor that present system for the point of tutor view and sub-serve to manage student groups and students, test creating and correction, individual tasks. Allow communication with students, student planes assembling and setting deadlines for particular tasks. Tests can tutor created using question database created in authoring tools. Tutor defines question selection process based on criteria, difficulty, time ambitious, groups of themes and order. Tutor can insert or remove concrete question into test template. Tutor can define final or self tests. System is designed for on-line testing which is realized direct into teaching server. Off-line tests are generated for printed version which is delivered to students and their typed results are inserted back into system.

Third view is from the administrator side; leading necessary system evidence, add student into study groups, define study planes and control authors and tutors work.

Communication tools are an unmovable section of the LMS. These tools are use for communication between tutors and students or students to students. Primary contain internal e-mail, which allow messages and files sending and receiving. Other element is the calendar; in this case the tutor could insert timetables, send and correct tasks and special massages. Student can plane other detail tasks for current course. Discussion is consultation tool. Discussions don't need to be in real time and are structured thematically by chapters. Same tool for on-line consultation is chat. To communication tools was insist high demand to reserve interactivity between tutors and students to eliminate impersonal contact.

Every user in teaching system can define self profile, which is available for all tutors and student in same group. This profile is needful pro personal contacts with colleagues and for study activity.

Portal superstructure serves for common information presentation about study, communication and login into system. When is system realized as stand alone application into one institution, is possible to use portal superstructure fro presenting students information, way and contain of study. Opposite situation I teaching system inserted into firm IT infrastructure and teaching system cooperate with other managing system for current organization through assessment method or direct interconnection. System is incorporate to organization structure and receives their philosophy.

3   NEW WAYS IN DEVELOPLMENT AND EXPLANATION

The idea of the actual project was presented in more than one thesis during the last year. The project was introduced again in the ICTE 2003 and SCO 2004 conferences. For teaching materials authors was realized two training lessons of RCCV at VSB. The RCCV supported authors, tutors and students manual realization.

Future task is e-learning standards support. Nowadays is possible to export system into XML files, which always contains data structure description and output data. At this file is attached a collection of multimedia elements. This kind of standard enabled other LSM system import contains of materials designed in Barborka teaching system. In progress AICC, SCORM, LOM standards implementation, which will be used for export and import course in authoring system Barborka. Standard supporting is necessary for cooperation with other teaching systems to use their sources and again to present self contents to other authors (systems) communities, which are interesting in e-learning.

Most interesting part for research is analysing feedback information. System contains basic statistical evaluation for elements designing. Other way could be in authoring tools to protocol students work, their study activities and document walk path storing, time spend to particular elements, correct answer validation for questions used in final tests, self tests or simply question usage in lessons or chapters. This objective form of user work evaluation is limited to on-line traffic. Other tasks realized out of central system are not concentrating into central database. Into LMS were added functions recording all operations realized by students, tutors and authors. In Authoring system is tool for statistic compilation and final value visual representation. Observed values are divided by type of used computer and software, user groups, type of explanation elements, study spend time and other valuable quantity. Author can define time interval for evaluation. Selected set of values restrict additional filter for relevant values. For presentation in table or graph for are defined one or two dimensional array which represents resulting values. To receive more information author can use additional statistical methods to array item. For searching and validating process can author use some predefined tests or create own special test for special relevant results.

Developing information sources integration. Presently separated channels – chat, discussion, email and calendar can be connected into one system. This combination reduces disorientation, redundancies, inconsistency for some information. In chat can author use information from discussion and chat was stored in same structure. Tutor eliminates non relevant information. Final result for the central information controlling will be databank contains for all course problematic passage explanation, model tasks, theme oriented questions and answers. This databank is created for several years when course is in progress. Positive of this databank is tutors time saving, which wasn't to explain same task for different students just present link to existing information file about asked problematic. This idea reduce time requirements fro tutors but not full replace tutors work.

4 PRACTICAL EXPERIENCE WITH AUTHORING TOOL

In new implementation was verifying functions of authoring system. This new system was after publish time changed to repair errors and adding a lot of new functions and work processing methods.

System start uses about 10 authors – specialist from different part of science spectrum, not only informatics. These authors process materials for PHARE project for Regional Centre of Lifetime Education (RCCV) in VŠB – TU of Ostrava. Authors use miscellaneous possibility of authoring system that was added wizard for fast same type element creating, which support predefinition of common used values and describe possible values for detail explanation for all input fields and possible input values. Into authoring system was added methods for fast high level elements designing, function for fast adding elements into higher level of items. This function reduces time for designing teaching material to 30% of previous time for the same operation.

To some departments were realized courses about Safety work, Ecologic activities, Geographic information systems, Risk analysis, Database technologies, Computer Graphics and compilers. Nowadays the system was tested for technical English linguistic course use.

Other cooperation was established with Department of Physics and Department of Mathematic, there is presentation of complicate math formulas and physical processes. Again is realized large set of multimedia questions for testing.

System is ready to realize many model of study. From didactical point of view the system fulfils automatically every requirement for teaching. Limit for the system is the language that we use for implement. In fact as internet application the system is limited to quality and speed for connected user. In general is not applicable to use huge video data with high resolution for the majority of the internet users. This negative point of view is significantly reduced when the system is use in LAN. Also large video sequence can be substituted to impressive animations which are stored in vector graphic format for reduce the data size.

The main problem of user options, after same statistics, is the internet connection, other technical parameters for users and authors are more than sufficient.

For the difficulty of the subjects, graphical presentations or animated illustration was the best way compromise between graphic designer and author of courses. Designer realizes necessary graphic elements, author use simply language to specify visual and contains requirements in simply graphical explication, which are converts to the final visual form from graphics experts. This practice was approved as fastest process for elementary course designing.

Some author not store own materials into authoring system, but every author know the logical structure of this system to maximally use all methods and services.

5 STRATEGI OF ADDITIONAL PROJECT DEVELOPMENT

Previous version of project implemented as thesis in computer science is now realized by same authors as post gradual study with support from MSMT expansion support program.

In progress is multi-language version which calculate prior Slovak and English language version. Very interesting is finding additional partners for cooperation and teaching material realization, adding new system options and possible distribution activities in other countries not only in EU.

Final target is to create interactive, adaptive, complex system, which present comfort, tabular, friendly interface for tutors, authors and particularly for students.

REFERENCES

Fasuga, R., 2003. *Autorský systém pro e-learning,* 1. vyd. Ostrava : VŠB-TU Ostrava, 2003

Holub, L., 2003. *Řídící systém pro e-learning ,* 1. vyd. Ostrava : VŠB-TU Ostrava, 2003

Fasuga, R., Holub L.: *Autorský software Barborka*, 1. vyd. Ostrava, Ostrava University Editorial 2003., ISBN 80-7042-888-0

Fasuga, R., Holub L. *LMS Barborka,* 1. vyd. Ostrava, Ostrava University. 2003, ISBN 80-7042-888-0