

# The BEST e-Learning Practices

Assoc. Prof. DSc. George Totkov, Daniel Denev

Department of Computers and Informatics,

Technical University of Košice, Letná 9, 042 00 Košice, Slovakia

E-mail: kollarj@ccsun.tuke.sk

## Abstract

The aim of this paper is to present the experimental results from testing of different e-learning solutions in the frame of on-going eTaster project (Socrates Programme, Minerva Action). The Project focuses on developing an innovative approach for enhancing international and multilingual e-learning course development and delivery of 12 short, freely accessible, on-line courses. The goal of the presented experiment is the comparison of the same learning course realisations in different virtual learning environments and platform called Plovdiv Electronic University (Plovdiv University, Bulgaria). Different learning design, didactic methods, content packaging and delivery models, services and collaborative tools supported by both e-learning systems are presented too.

**Keywords:** International Projects, content packaging and delivery, e-Learning Environments, modeling of the learning process, e-learning project management, LAMS, BEST, PeU v.2.0, Moodle v.1.6dev.-2.0, ICT, VLE, LAMS v. 1.0.2- v. 1.1 Internationalization, PALO, EML, IMS- Learning Design (IMS, 2003), Learning Design, Moodle-LAMS integration specifications, standards, recommendations, pedagogically neutral software technologies, educational process reflection and modeling, e-pedagogical models, educational paradigms, concepts and operations, educator-developer, learner-developer, pedagogical descriptiveness, social constructivism pedagogy

## 1. Introduction

The title of the paper shows clearly quadruple **meaning** – the four main aspects of this research. First of all, it summarizes shortly the realization of different pedagogical models in the known e-learning environments refer to BEST (Bulgarian Educational Site) development. Secondary aspect of the research presented is the social constructive pedagogical approach with learning design elements into social groups' concepts construction during the modeled collaborative work processes. We gave prominence to the BEST known practices those results to an e-learning technologies quality enhancement, as a goal of this research. In the third place we dwell on content packaging and delivery (portability and compatibility). Another interesting concept was adopted into BEST and shortly discussed is e-Learning projects management as a new approach to processes wrapping and platform adaptability to the Educational Institution requirements. Finally, the paper shares an example of best experience

gained using the already developed Best prototype.

## 2. Models of Pedagogy

In the last years a number of projects related to this approach are performed, for example, Moodle [1] [Malikoff, Dougiamas, 2005], LAMS [Ghiglione, 2005], PeU (Plovdiv electronic University) – ver. 1.0 and 2.0 ([Totkov, Doneva, 1998], [Totkov, Somova, 2002], [Totkov, 2003]), [COEDU EducatioNet (2005). <http://www.en.coedu.hu/>] COEDU etc.

**Moodle** was designed on base of social constructivism. Constructionism asserts that learning is particularly effective when constructing something for others to experience. The students could be considered as actively engaged in making meaning. Teaching with that approach looks for what students can analyze, investigate, collaborate, share, build and generate based on what they already know, rather than what facts, skills, and processes they can parrot. Moodle has modular design that makes it easy to create and

manage user groups and learning content but there has not tools for learning processes design or other kind of pedagogy reflection. Also there has not functionality for Educational Institutions hierarchy creation and management. Moodle has “content-users” driven approach offering content-centric learning models with collaborative groups of learners.

The **LAMS** sequence is the online lesson plan/model in this case, left behind for the cover lecturer to implement. Lecturer could still run the sequence without he knowing what was on the lesson model/plan. He could look at it as he went through. LAMS give opportunity for creating reusable empty sequences’ templates. Significant functionality in this platform is Educational Institutions hierarchy creation and management. In contrast to Moodle, in LAMS platform not easy to manage social groups. Due to the software architecture it is difficult to communicate with another e-learning environment or implement external modules.

The **PeU** ‘pedagogical meta-model’ allows courses (by the graph representation of the appropriate learning process) to be created for different didactic methods. This PeU feature expresses its key difference from LAMS and Moodle. In the PeU learning models/plans, activities are specified as means of expressing the “learning flow” including decision-points, sequences, choices, etc. For example, performance in one activity determines the next learning sequence. Plans could be considered as dual specifications, specifying the both – didactic logic and learning content. The last is the merit to call the PeU approach “pedagogically-driven”. Following this approach any pedagogy could be expressed at a sufficiently high level via a graphical specification. This approach allows a diversity of pedagogy used. The high level of abstraction and flexibility makes these models a very powerful tool for expressing very different learning scenarios, including personalized learning.

The **COEDU** distance learning system – knowledge network (COEDU EducationNet, 2005) is an easily accessible tool for online education, capable to service large organizations

and is developed by Mimoza Communication Ltd., Hungaria. The system can simulate complex educational processes – real-life education. It possesses a comprehensive, multi-levelled user management system, supporting the typical players of an educational process – student, tutor, author of the curricula, student administrator, and more over educational processes and user accesses can be restructured and reorganized as needed. COEDU provides progress tracking/control mechanisms for the tutor, for the student – adequate feedback and for the both – a suite of interactive applications, to ensure communication, taking place as part of the teaching process and to maintain contact (Forums and Chat rooms) easily. An editor software tool is specifically developed for the purpose of authoring and publishing curricula for the COEDU system, by specification of so called “script files”. Content can be easily extracted for use with external systems (internet, intranet, CD-ROM disk or printers), but thanks to the XML-based content data system, the range of output devices can be easily expanded.

The COEDU is also capable to handle existing curricula (thanks to its XML-based content data system). It can be easily adapted to process and import content data of various external formats (including SCORM standard).

### 3. The BEST’s Model of Pedagogy

All educational institutions have own expectations about an e-Learning environment. There has no universal platform to come up their expectations. The question is “May the Educational Institution has global tool for e-learning project management tool?” That way it will be possible to all together points of view on process and events pedagogical model and adaptability to specific educational requirements.

The necessity of modeling of the learning process ensues from the following observation: the learning process does not consist only of ‘absorption’ of learning content, learners that are not active in the learning process do not learn well; therefore the adequate modeling of the teaching/learning

process, in all its completeness and variety, is essential for the success of the e-learning.

The BEST model/plan of the learning process (MLP) is an explicit representation of the learning process logic ('learning flow') depicted visually by a graph structure. The MLP graph consists of interlinked learning objects (LO), where an LO could be: a content element (core learning material or additional learning material as dictionaries, useful links to virtual libraries and other electronic resources, software tools for creation and solving problems, writing homework, constructing texts and so on), a learning activity (self-assessment, examination, group activity – consultation, forum, discussion, etc.), a teacher impact (feedback, marking, etc.) or a control (decision-point, sequence, choice, parallel combination etc.).

Thus, the MLP allows the both:

- The definition of the 'learning flow' in a e-learning course, i.e. it could be considered as dual specifications, specifying the didactic logic and in the same time the content and active objects (all tools for the educators and the learners accompanying the learning process);
- The interpretation of the e-learning course, i.e. execution (on-line learning), registration and control of the course 'learning flow'.
- Representation of the knowledge in the subject domain as ontology, structured according to the basic concepts of the SD. The elements of the model are coherent parts of the knowledge content called reusable learning objects (RLOs). RLOs are described by corresponding metadata elements, characterizing its entity regarding different points of view: informational (author's name; subject; file name, data and time), descriptive (study level, learning hours, etc.) and conceptual (concepts from the SD presented).
- Automatic generation of an e-learning course in the modeled SD using (in addition to the CMSD) a definition of the course subject, the learning objective, the study level etc., all expressed in the terms of the SD concepts.

The interpretation is performed on the basis of the MLP but also using the explicitly supported model of the learner (including its profile, preferences, etc.). Thanks to this could be said that BEST supports and individualized and adaptive learning

(e.g. the results of the learner's assessment or activities are able to influence the virtual learning process). The learners may define their own learning objectives, monitor and regulate their own learning process and not the last, their learning is embedded in a social context; (collaborative learning).

A significant difference between the BEST approach and the previous works lies in the possibility to interpret the MLP of a given course from the different viewpoints (e.g. the viewpoint of a teacher, a learner, a guest and so on) and thus provide necessary services for different types of users. This means that using one and the same MLP for example, the teacher can test and check the course, the learner can learn the course.

Another important application of the MLP interpretation is the quality assurance of the modeled e-learning course – measuring of the educational quality on the basis of the MLP metadata and the learner's results and marks.

The BEST platform implements the following additional important features:

- full independence of the supported e-learning from the application field – studied subject field, learning activities, form and mode of learning, educational necessities of the learners, learning and teaching methods, etc.;
- intelligent support to the process of creation of learning materials and assessment tests (including multimedia tools, automated linguistic processing, test generation, etc.);
- web-based on-line learning, teaching, authoring and administration supported by various collaborative and communication tools;
- conversion to standard formats suitable for export to other e-learning systems, including conversion to e-books for autonomous browsing;
- automatized forming of groups of learners (thanks to the models of learners) according to similar educational needs and/or level, for studying the course or for team work, etc.

Finally we could summarized that the BEST environment provide complete support of the virtual e-learning process in all its dimentions

Features	Moodle	LAMS	PeU	BEST
Learning processess modelling	–	+	+	+
Learning conntrol and management with user interpretations of the model	–	+	+	+
Open source	+	+	–	+
Modular design and application architecture	+	–	–	+
Possibility to include learning activities in a linear sequence	–	–	–	+
Support of the different kinds of week curriculums	–	–	+	+
Intuitive userfriendly integrated interfase based on the common concept	+	–	–	+
Nonlinear structured course model and resource management	–	–	+	+
Learning and course sequences export	–	+	–	+
SCORM/IMS standarts support and package play	+	–	–	+
SCORM/IMS packages creating capability	–	–	–	+
Learning objects (IMS) repository and object management	–	–	–	+
Module integration capabilities	+	–	–	+
m-Learning modules	–	–	–	+
Videoconfering student/teacher	–	–	–	+
Special system mode for disabled students	–	–	–	+
Educational organisations management	–	+	–	+
Communication with other systems (compatibility)	+	–	–	+
Dictionary with conceptual autolinking	+	–	–	+
Virtual e-book library	+	–	–	+
Content filters	+	–	–	+

**Table 1.**

#### 4.

The experiment intends to taste the reusability of the e-learning courses – "tasters", developed via the COEDU learning environment in case of delivering via another virtual learning environment – PeU ,....

The ???both.... e-leaning environments pertain to the new generation of LCMS. LCMS are software applications for managing the creation,

storage, use, and reuse of learning content and supporting:

- on-line interaction between student and tutor to allow the negotiation and creation of study programs;
- management, categorization, browsing and searching of computer based learning resources;
- creation of personalized learning programs from these resources;
- creation of student profiles consisting of grades, comments and suggestions based on students' progress and other learning activities;
- sorting, searching and querying of these profiles to allow the updating of the study programs, etc.

Tasting the interoperability between COEDU and PeU is possible thanks to the common feature they possess – both systems support exchanging of e-learning materials in SCORM compatible format, and also due to the fact that the both use one and the same SCORM version, namely SCORM 1.2.

During the experiment one of the developed in the frame of e-Taster Project course, titled "Taste of e-Learning" was exported in SCORM 1.2 compatible format by COEDU exporting tool and later was imported into the PeU.

Figure 3. displays the general view of the "Taste of e-Learning" course in case of the delivering via COEDU. The "Taste of e-Learning" course consists of four Modules, where each of them includes a number of Lessons. The COEDU editor tool allows creation of different, non-linear orders of learning sequences for the purpose of course authoring. The learning sequence stipulated for "Taste of e-Learning" course is linear within each Lesson and fully order-independent regarding the sequencing of Modules and Lessons.

Figure 3. The COEDU course "Taste of e-Learning" delivering

Figure 4. and Figure 5. show correspondingly the plan of the course learning process in the PeU Graph Editor and the delivering view in the PeU Learning Subsystem.

Figure 4. The PeU course “Taste of e-Learning” learning plan

As a result the e-learning course “Taste of e-Learning” could be delivered via both virtual learning environments in similar way.

#### 4.1. Advantages and disadvantages of the approach followed

The results of experiment carried out, indicate some unquestionable advantages of using standardization to ensure interoperability between different LCMS. The necessity of transferring learning materials from COEDU to PeU did not known during the design and construction of the both software systems, but the reuse of online learning materials is still possible thanks to standardization. And more over it is possible independently from the particular LCMS used. Thus it could spend a lot of authoring efforts, time and money and also highly improve the quality of learning content.

We would like to put more attention on the some disadvantages pointed out of this study. They are not a discovery because similar problems could be encountered in all cases while trying to apply the version 1.2 of the SCORM for exchanging e-learning courses, because it do not support easily exchanging of group work or communication means and instructor-led or blended learning. So, as the SCORM 1.2 compatibility supported for the both LCMS regarded, was our chance, as in the same time it was the reason to face some problems.

Figure 5. The PeU course “Taste of e-Learning” delivering

The powerful LCMS to date allow for the learner to get a more personalised learning experience capability to work properly in the learning environment, and for the tutor – to have a far greater control over the path a learner takes through a given pile of content.

This is exactly the case faced in the presented experiment. The originally developed in COEDU “Taste of e-Learning” course consists of study units involving not only content elements, but also various learner and tutor activities, as learner’s

comments on parts of the content, outcomes of the unit, tutor’s feedback of learner’s assignment, chat and forum. Such kind of supported activities, which play a central role in the learning process, could not be imported in the PeU version of the “Taste of e-Learning” course, using the SCORM 1.2 specification, although the PeU model of the learning process is able to involve communication, and other activities performed by the learners, tutors, counsellors, etc. As a consequence the resulting PeU course version inherits from the COEDU version only the same content structure, but not at all course active objects or those supporting the possibility to reflect the teacher requirements or the learner behaviour. It does not mean that the PeU version contains no any of such objects. On the contrary, it does, but they are either some conventional, that are supported for all PeU courses (chat, forum, e-mail), or some objects requiring student activity that fortunately, originally are developed as stand alone units (flash movies).

#### 4.2. The experiment further

Another fundamental for the learning-teaching process is pedagogy – the methods used for teaching and learning – and the “teaching objects” in a course, such as assignments, learning activities, objectives, prerequisites and so on. There are three options for any learning technology when it comes to model didactic approaches: “pedagogy-neutral” (supporting no pedagogy at all), “pedagogy-standard” (supporting a single pedagogy) and “pedagogy-driven” (supporting a diversity of pedagogy).

Most current e-learning tools and technologies are “pedagogy-neutral”. They are “neutral” especially in relation of the logic of interpreting of the course content while no learning requirements are specified. On the other hand, there are hundreds of different pedagogical models and strategies. As recorded by many authors: learning is different from consuming content learning and the implementation of one pedagogical model/strategy is not the right direction for e-learning researches and standardization. For example, the course may consist entirely of activities without any learning content and thus its transfer to a ‘pedagogy-

neutral' or 'pedagogy-standard' system would be difficult.

The PeU "pedagogical meta-model" allows courses (by the graph representation of the appropriate learning process) to be created for different didactic methods. This PeU feature expresses its key difference from some e-learning systems offering content-centric learning models. In the PeU learning models/plans, activities are specified as means of expressing the "learning flow" including decision-points, sequences, choices, etc. For example, performance in one activity determines the next learning sequence. Plans could be considered as dual specifications, specifying the both – didactic logic and learning content. The last is the merit to call the PeU approach "pedagogically-driven".

Following this approach any pedagogy could be expressed at a sufficiently high level via a graphical specification. This approach allows a diversity of pedagogy used. The high level of abstraction and flexibility makes these models a very powerful tool for expressing very different learning scenarios, including personalized learning.

The goal of the further experiments was to study how the learning process of the "Taste of e-Learning" course could be planned using more than one didactic methods and also using the all means for pedagogy expressiveness of the PeU approach.

While the Figure 4. presents the learning process plan of the "Taste of e-Learning" course directly imported from the SCORM 1.2 format (exported by COEDU system), the Figure 6. demonstrates another plan, where the implied pedagogy strategy enables personalized learning paths to be followed, depending on a learner's progress. This means, that the order and the elements in the sequence of learning objects a concrete learner is passing on-line, are determined dynamically. The learner's path is driven by events and activities (like self-assessment on-line and off-line tutor-assessment, consultation, forum participation).

Obviously, the structure of the both plans produced with the abilities of the PeU Graph Editor, as well as the pedagogy restrictions and requirements to the represented learning process are completely different in spite of the identical

learning content objects included. Therein the both graph representations are in essence two didactic templates, based on one and the same learning content. In this way we could reach real course flexibility and which is more important adaptive learning and possibility to experiment with different didactic methods.

## 6. Conclusions

The common case, on the point of view of the necessity to maintaining course interoperability between e-learning platforms, is: a system X can not interpret courses of another system Y. For real interoperability we need an expression of the complete learning process (course), regardless of the tools used to make or run the course.

In our case, the e-learning systems used in experiment possess the ability to express a course teaching-learning process: the PeU – via a visual graph representation and the COEDU – via "script files". So the precondition for real interoperability and collaboration between our institutions is at hand.

The other positive circumstance is the release of the SCORM 2004 specification. The SCORM 2004 provides more complete support of IMS Simple Sequencing, as well as of objective-based sequencing and branching.

The comments above determine the perspectives for the future work in the direction concerned in the paper: to face the challenge to avoid the discussed limitations and to maintain full interoperability between COEDU and PeU we have to try to lift from a SCORM 1.2 to the SCORM 2004 compatibility of the course content.

In conclusion, the current versions of the experimentation course "Taste of e-Learning" are accessible correspondingly, the COEDU version – via <http://www.en.coedu.hu/> and PeU version – <http://e-taster.pu.acad.bg>.

Figure 6. The PeU course "Taste of e-Learning" – another learning plan

## 5. Conclusion

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