Practical Pedagogical Issues for Lecturers' Adoption of e-Learning Design Approaches in BEST/LAMS Learning Design Management System

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Abstract

Integrating the specifications and tools for Learning Design (LAMS, 2005), Learning Activity Management System into BEST (BEST, 2005-'06), Learning Management System (LMS), is not just a technological question, but also relates to practical, pedagogical, and philosophical issues. This paper discovers pedagogical point of view related with tools and standards implemented into LAMS and BEST environments. The differences were then summarized into technological and pedagogical general implications for future versions of these complementary systems combining Learning Management and Learning Design's potentialities with new e-pedagogical principles. This study concludes that continued, open dialogue between lecturers, pedagogues, developers and students of both LAMS and BEST is necessary to achieve transparent integration.

Keywords: *BEST, PeU v.2.0, Moodle v.1.6-2.0, ICT, VLE, LAMS v. 1.0.2, PALO, EML, IMS-Learning Design (IMS, 2003), Learning Design, Learning Management, integration, specifications, standards, recommendations, pedagogically neutral software technologies, educational process reflection and modeling, e-pedagogical models, educational paradigms, e-learning, studying learning design, concepts and operations, educator-developer, learner-developer, pedagogical descriptiveness, constructivism*

1. Introduction

The educational process is based on 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).

A great part of the contemporary software tools and technologies in the e-learning field can be characterized as ***subject-dependent*** (preorganized for specific fields and users) and ***pedagogically neutral*** (they don't support or provide any kind of methodical strategies and more specifically they don't specify ways for interpretation of learning content and objectives that are dependent on other conditions). 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 creation of any new approach is a complex endeavor, and most particularly in a practice-based craft such as teaching and learning. Students and lecturers have an interest in a common method of exchange across borders, languages, codes, venues, methods, philosophies, and interfaces. Until now, however, this exchange has been limited to printed materials, a costly and physically limiting media. Early attempts at digital standards have focused on narrow areas such as quiz question packaging or sequenced content. Yet, educators in particular are hungry to share full courses and learning scenarios, complete with content and processes that they have found useful. The Learning Design (LD) in BEST/LAMS is one attempt to bring that fuller picture to electronic exchange that can theoretically include all forms of highly complex and flexible learning for both online and face-to-face learning venues.

Traditionally, the design of pedagogy has been the sphere of expert instructional designers and software engineers. With the advent of easy-to-program web scripting languages and simplified digital authoring software, ordinary lecturers are playing an increasingly leading role in the creation of learning objects and packages (SCORM/IMS). Furthermore, the necessity of LD management systems with pluggable modules and point-and-click configuration has allowed lecturers to experience unprecedented freedom of LD. Now they want to share learning objects (LO) or learning units (LAMS Sequences) with each other, first in teams, then across departments in Inter-University Network (The Bulgarian national repository 20.06.'06), and now amongst any Bulgarian educational institutions using any kind of system (they all are good but if they come up to European and world standards?). That is the emergent demand which leads to their interest in international standards. As the role of educators grows, we see other lecturers such as engineers, academics, developers and IT professionals playing a comparatively less directive, but more supportive role in the co-creation of BEST. Educators are especially interested in joining in this dialogue with the LD.

BEST is a Learning Design Management System (LDMS) that has rouse interest for the IMS-LD specifications over the past two years. At that time, it was noted that the Learning Design specification was the most congruent standard. Since it allows educators learning scenarios as sequences of learning activities rather sequences of learning contents or objects to be constructed. BEST has multimode Since it allows educators learning scenarios as sequences of learning activities rather sequences of learning contents or objects to be constructed.

BEST would be used for many kinds of educational applications because it is pedagogically neutral. It is based on modeling-social-knowledge principles similar approach has Moodle (Dougiamas, 1998; 2000) and most suited for an educational approach involving social knowledge interaction modeling amongst educators and learners rather than simple delivery of sequences of learning contents or objects. Furthermore, the PHP scripting, modularity, EML communication between BEST and LAMS allows educators to supervise the creation of new activity tools in BEST—the emergence of the educator-developer. BEST/LAMS allows management of huge hierarchy of Bulgarian educational institutions to be managed (at the same time).

This paper represents an overarching presumption we hold is that BEST learning design and management process must be intuitive and empowering for educators, and not intended solely as the professional sphere of instructional designers. Our primary aim was to discuss the pedagogical and philosophical aspects of the process of moving to an Bulgarian Educational Site (BEST) faced up to European standards

in this realm, IMS-LD, and secondarily to illustrate that process with our initial testing of LAMS/BEST. Our research questions addressed in this paper are threefold:

- If LAMS could be used as a medium for design and exchange of teaching tools and materials, how will it affect the pedagogical principles in BEST?
- What are the attributes of the BEST way of LD that we wish to preserve?
- What are some potential new pedagogical strategies for integrating LD into BEST?

Our research includes: 1) description of our method for investigation, 2) outlining some difficulties in understanding the relation of LD and Constructivism, 3) exploring LD and LD-related tools in a BEST ?l-environment, 4) drawing implications for the future of the BEST) making similar implications for future development of ?**Social Knowledge Learning Design Model**.

2. Pedagogical Aspects of E-Learning

The principles of ***traditional learning*** can be classified in three groups:

- ***general*** (humanization, scientific approach, systematization, development);
- ***related to content*** (correspondence of the learning objectives and content to the state educational standards, historic continuity, complexity, completeness);
- ***didactic*** (correspondence of the didactic process to the learning regularities; harmony between the didactic, educational and development function of the learning process; stimulation and motivation of the learners; combining of the collective and the individual work during the learning process, of the abstract thinking and the visual demonstration in the learning process; conscientiousness, activeness and independence of the learners guided by the educator; systematization and consistence of the learning process; accessibility; guaranteed acquisition of the learning content.

Four stages can be defined in the development of the ***distance education pedagogical technologies***.

- **1st stage** – Distance education (DE), in which the learning process is organized according to the scheme *'educator – one or more learners'* with limited communication (post, phone, computers) and lack of systematization and complexity in the use of distance learning tools;
- **2nd stage** – DE, in which the learning process uses the scheme *'educator – multiple learners'* with a more complex kind of communication;
- **3rd stage** – DE, using Internet as an alternative of the traditional educational forms;
- **4th stage** – DE using integration of different types of communication (including synchronous video communication and software simulators) and based on virtual learning technologies.

Even a short comparison of the main elements of the learning for the two educational paradigms (Table 1.) shows that the above mentioned principles should be further developed for the case of distance education.

Element	Type (in respect to the educational paradigm)	
	Traditional	E-learning (Didtance)
Major objective	Preparation for life and work	Providing of an environment for self-determination and self-realization of the personality
Knowledge	From the past (''school of the memory")	From the future ("school of the thinking")
Learning process	Teaching the learners certain knowledge and skills	Creation of own world model with active work of the learners
Learner	Object of the pedagogical activities (effects)	Subject of the cognitive activity
Type of the relation educator - learner	Monologic	Dialogic
Learner activity	Reproductive, "reactive"	Active, creative

Table 1. Major learning elements for two educational paradigms

The contemporary e-learning courses are based on professional tasks and not on the logics of scientific knowledge. The main criterion for the choice of the taught knowledge is its applicability to specific professional tasks. As a result there is a transition from the subject principle of learning content creation to the creation of integrated learning courses, reflecting a complete (integrated) professional approach (and fundamental knowledge is not ignored). The importance of universal (methodical) knowledge for assessment and prognosis of the future is increasing. The requirements to educational organization methods and forms and in particular to the preparation of the educators for their new role in this process are changed significantly. Individual and group forms of active work with the learning materials and information become predominant. The type of activities performed by educators and learners is vastly changed together with the nature of the relation between them during the learning process. There is a tendency for the learner to become a full-fledge subject during the process of solving learning and professional tasks – with the support and collaboration of the educator.

DE essence and characteristics together with the wide use of ICT in its organization and implementation make necessary the formulation of additional ***didactic principles*** related to:

- *organization* (the content of the learning materials and the organization of the learning process should be built on the basis of the major learners' activities);
- *support* (creation of a user-friendly environment for learning process support);
- *communication* (openness of the communication forms and tools);
- *effectiveness* (optimal combination between the different management forms of the learning activities of the learners, economical suitability[1]);
- *moduleness* (learning courses represent subject fields and for that reason the curriculum may consist of different courses depending on the individual and group educational necessities);
- *interactivity* (indirect personal interactions 'student- student, 'student - educator, etc.);

[1] The comparison shows that DE is about 50% cheaper than traditional education. At the same time it should be noted that it requires higher initial investments.

- *individualization* (of the knowledge and grading of specific learners);
- *control* (strict reglementation and management of the activities using ICT);
- *suitability* (avoidance of unnecessary and pedagogically ungrounded use of ICT);
- *flexibility* (e.g. choice of time and place for learning);
- *openness* (participation of learners with different initial level, without interruption of the work; with specific educational necessities, etc.).

The experience gained in the implementation of the new educational forms and the changed notions related to the personality and its development allows the formulation of additional specific ***de-didactic principles***:

- *personality-oriented* nature of the educational curricula (marketing approach, consideration of the educational necessities of the learners);
- *practical orientation* of the content and the activities;
- *activeness and independence* of the learners as major subjects in the learning process;
- *Case studies*. The interaction during the learning process has dialogical and case oriented nature due to virtual simulators and communication;
- *reflexiveness* (learners' realization of the content and the ways to participate in the learning activities, and especially – of their own personal development and acquisitions);
- *variety* of the educational curricula – the learning content should reflect multiple viewpoints to the problems and their possible solutions;
- principle of the supporting *motivation*;
- *module-block principle* for organization of the educational programs content and the learning activities.

3. Handling LD concepts and operation in the BEST l-environment

The initial immersion into Learning Design gave us an experience of confusion over terms, concepts and tools. Our group constantly mixed discussions amongst conceptual points, codified specifications and multiple tools which are in various stages of development. Teachers will need to grasp these differences before a meaningful discussion can take place. In addition to clarifying the different terminology and the functions in a) Functions and Terminology and b) Pedagogical Descriptiveness,, we critically examined the assumptions behind the specifications and tool operation in c) Bricolage, and d) Topology.

3.1 Functions and Terminology

LD is a notation, a proposed standard for modelling learning scenarios, while Moodle is an LMS, a complete package for managing, designing and leading courses. Thus the two do not compare directly, yet each uses a language to describe the process of designing a learning activity. The differences in the terminology are subtle and the absence of some concepts in each other's lexicon is a useful indicator of differences in concept, role, or operation. Here are examples of these differences and a chart (Table 1) which attempts to summarise the terminology.

In Moodle design, the base structure is a "course", while in LAMS (LD) the principal term is a "Unit of Learning" (UOL). A Moodle course includes user management,

enrolment, learner monitoring, activity modules (tools), resources (attached files and links), all arranged in an infinite number of learning units. In LD, the Unit of Learning is a packaged sequence of activities, roles, content; while Moodle has no direct equivalent (it concerns pedagogical descriptiveness). While in **BEST** UOL is a whole course, in general, it is assumed that a number of UOL will be assembled to make a full course. The assembling package is called an LDMS, and LD is not directly concerned with that. Associated with IMS LD are various firms and educational institutions which have developed software tools called "editors" which create designs, and "players" which run them for students. In Moodle, those two roles are integrated in one environment. Other differences are illustrated in Table 1.

Table 2: Differences in Terminology for BEST Learning Design Management (LDM) and Moodle LMS

Generic Concept	Terminology in BEST LDM	Terminology in Moodle
A subject/course of study	Unit of Learning	Course
A module, unit, project within a course	Unit of Learning	None—perhaps Topic/Week Boxes
A packaged sequence of activities, roles, and files	Unit of Learning	None—perhaps Lesson Module, Workshop Module, or the Main Course Centre Column
A task that a learner does	Activity	None (no explicit term, except in proposed Project Module)
A moduler tool—forum, chat, wiki, quiz	Tool or Service	Activity Module, Activity
Reusable content	Resource, webcontent	Import (Quiz, Glossary, Resource)
A file, link, or external learning activity	None	Resource
A link or process to use external packages	Services, IMS, Hotpot, SCORM, QTI	Hotpot, SCORM, QTI
A link to XML external files with IMS LD global elements	Imsl-dcontents and objects repository of shared objects, creation of learning object (autonomus by integrated WeLOAD)	None
A combination of resources and services	Environment	None—perhaps Course Centre Col.
A specific sequence of activities for some learners	Path	None—perhaps Lesson, Workshop
A requirement to fulfil before playing a UOL	Prerequisite	None
Hidden software that interprets the specification. A rule system	Engine	None
A software or script for designing a learning unit	Variety of editors and views	"Turn Editing On" Button
A software or script for viewing/operating a learning unit	Player (SCORM/IMS, Sequences and etc.)	None—perhaps whole Moodle course with no editing rights
A software to make a course available for view	Publisher	Restore
A way to add external software packages	Web services for communication with LAMS, EML, APIs and etc.	API in ver. 1.6
A summary of a learner's marks	Monitoring Service, Gradebook, GD graphical diagrams, progresbar	Gradebook
A summary of a learner's participation	Activity Report and Monitoring Service	Activity Report
A summary notation of the learning design	XML manifest, EML hierarchy	Backup—no files, no user data
A summary of activities and content	Backup—with course files, IMS objects by Integrated WeLOAD module	Backup—with course files
A summary of activities, content, and user contributions	None—user data not included	Backup--with course files+user data
A course/topic in action	Run of UOL	Course (educators/student enrolled)
A user-supporting tool, linkable	Sticky blocks, disabled students mode, Curriculum module, e-books virtual library and etc.	Blocks, Calendar
A variable that is used to build user portfolios	Property	None
A service for user to look at their own properties or others in a structured way	Monitoring Service	None—perhaps Profile, Portfolio
A variable setting of any learning unit to add more personalization facilities or configure its use	Condition	Activity Module Settings
A message informing of some action, possibly also	Notification	Subscriptions (only simple

assigning new learning to roles based on certain events		messages)

4. E + Learning vs. E – Learning /

An adequate model of the learning process according to us should be basis of e-learning – in a wide spectrum of subject fields and with possibilities to apply different pedagogical strategies (conventionally called ***e+learning***). According to this approach a virtual course is modeled not only by the learning content (learning materials) but also by tools (for the educator and the learner) and learning activities (examination, consultation and forums) accompanying the learning process. A number of projects related to creation of tools for learning process modeling are performed *EML* […],*Moodle* [….], *LAMS* [….], *PeU* [….], *PALO* [….], etc.

4.1 EML

EML is defined as a semantically rich information model and binding, describing the content and process within units of learning from a pedagogical perspective in order to support reuse and interoperability (see Koper, 1991, 1998, 2000). To state it differently: EML is a semantic notation for units of learning to be used in e-learning. The modeling is done with use of the Unified Modeling Language, UML (Booch *et al,* 1999) and the binding is in an XML schema. EML should allow to model different kinds of pedagogical models, including the more traditional teacher directed and information transmission based models, as well as the more student cetred, collaborative and constructivist approaches.

4.2 Pedagogical level

At the **pedagogical level**, educational institutions are faced with new paradigms of teaching and learning, which have been established in order to make education more effective.

The BEST UOL architecture focuses on the following concepts:

- learning is an goal-directed process;
- learners may define their own learning objectives and monitor and regulate their own learning process oal-directed process;
- learning is embedded in a social context, principles of collaborative learning;
- assessments and tasks are both product knowledge driven.

4.3 Technological level

Bulgarian educational institutes are faced with large investments in infrastructure and the problem of rapidly changing technology. Especially when course development and delivery are integrated into technology, the problem arises that technological change leads to conversion and adaptation problems in the educational content and processes. Nowadays, a lot of courses are adapted or written for the web, or more specific: for a particular Learning Management System. The web has a lot of advantages, but also has its disadvantages when compared to other media and face to face meetings. Developing courses for a particular delivery format, such as the web, does not provide the flexibility needed for fully flexible,

effective and efficient education. This reasoning has led to the conclusion that we must focus on the development of BEST that is a medium neutral, interoperable units of learning instead of units of learning in a medium specific format.

Axioms of the pedagogical meta model:

a) A person learns by performing goal directed activities in an environment

b) When a person has learned, learner is able to perform new activities or perform activities better or faster in similar environments or to perform the same activities in different environments

c) BEST consists of a set of objects and learner/educator beings that are related in a particular way.

d) A learner could be encouraged to perform certain activities when:

- The activities can be performed by this learner, given the requirements in terms of pre-knowledge, personal circumstances and the performance context.
- The required environment is made available.
- The educator/learner is motivated to perform the activities.

e) What had been posed here with respect to a single person, also applies to a group of persons.

Is it possible?

Is it possible to model units of learning in EML and implement that into BEST, with a variety of pedagogical models, support of medium neutral delivery of the material and interoperability?

What they offer?

Moodle is an alternative to proprietary commercial online learning solutions. It is an open source course management (and content management) system in witch activities are at the heart of the system. 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 new courses, adding content that will engage learners. This modular object-oriented dynamic learning environment possess intuitive interface that makes it easy for educators to create courses. Educators and students require only basic early acquired from Internet browser skills to begin learning, which makes last one very simple and user-friendly platform.

LAMS offers lecturers a structure on which to build their lessons. Writing a LAMS sequence means that lecturers need to make their teaching explicit through the structure of LAMS and this process requires them to think about how they build a lesson. This can benefit all members of staff, but especially those new to the profession. The sequence structure in *LAMS* can also facilitate the design and

delivery of the lesson by different people. The person delivering the lesson does not necessarily need to be a subject expert thus making a case for using *LAMS* for cover lessons. The *LAMS* sequence is the online lesson plan 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 plan. He could look at it as he went through.

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.

It's natural to ask the question – is it possible to create a system combining the advantages of the three systems? The present work is concerned with the answer to this question. We will omit the detailed comparison of the systems and will point out only fucntionalities that are realized in LAMS, in PeU, or in both:

?) ***Both in LAMS and PeU***: models of the learning process, learning management with different interpretations (depending on the user) of one and the same model, etc.;

B) ***In LAMS, but not in PeU***: open source, possibility to include learning activities of communication type (Chat, Forum, etc.) in (linear) order of activities, support of several klinds of weekly schedules; 'simple' design and user friendly interface based on common conceptions and rules, etc.;

C) ***In PeU, but not in LAMS***: not linear structure of a learning course (and of learning materials too) using logical and control structures (*and*, *or*, *case*, *while, hub, router*, etc.), and as a result – the system is adaptive to the learners; learning based on concepts (including generation of a learning plan based on a given Concept Map in PeU 1.0); powerful test system based on pedagogical requirements; wide user typology (authors, educators, managers, local and system administrators, guests); administrative subsystem (including learning process management of student groups with different curriculum), etc.

A project for VLE, named ***BEST***[2]***,*** is presented in this work. The project realizes an e+learning conception. Experiments with the beta-version[3] of ***BEST***, realized on the basis of three of the already mentioned systems (Moodle, LAMS ? PeU2.0) are encouraging, and confirm the correctness of the project decisions.

[2] **B**ulgarian **E**ducational **Si**te

[3] The realization of the system will be described separately.

5. Pedagogical Descriptiveness

Many aspects of Learning Design can model pedagogies far more complex than the current capacity of Moodle in its version 1.5. This especially includes the structured sequencing of activities/resources and the roles of learners and teachers. Till the BEST, construction of a UOL has been fundamentally different in Learning Design than that in Moodle. A unit of learning in LD is multi-dimensional (Olivier & Tattersall, 2005), including a collection of activities that can be forced-sequenced, conditionally-sequenced, or non-sequenced. Content can be embedded within the unit of learning, not just separated in a simple sequence. In the Moodle interface and underlying code, there is no formal UOL, just separated activities inside a course, and only visually "connected" in a vertical column of the main interface. Content is also separated as individual files and links, called "resources". It is one-dimensional in the sense that each resource and activity module ("tool" in LD) is totally independent and arranged under topic-labels, not formal UOL structures. This is an advantage in terms of ease of design, but a disadvantage when a particular learning unit needs to be containerized and component dependencies described. In setting up a Moodle course, there is a blank column of topics or weeks--almost no structure "out-of-the-box", but an arbitrarily complex structure can evolve over time. Learners experience maximum control because they can visualise the whole structure and are given full access for free inspection, skipping, jumping back anywhere on the main course page. Teachers, as well, as they edit in Moodle, are often given a start with a set of preformatted choices, but with freedom to reconfigure. This could be called "open learning design". However, in some BEST editors, such as integrated as BEST module WeLOAD, a educator starts with an empty canvas and can decide to design anything, but without the initial prompts to spur/constrain creativity. In this mode of "fixed learning design", an LD editor allows the learning designer to decide what parts of a learning flow control are "automated", what parts shall follow hard coded sequencing rules ("conditions", defined by the learning designer), and what parts are just containers for more or less freely negotiated social interactions.

In addition, roles in Moodle are **limited to** "teachers", "students", "course creators", and "administrators". Moodle tacitly assumes that the learner's role will remain the same throughout the course. While a learner can be switched to a teacher role in Moodle, **only** one role can be played at a time and reassignment requires manual intervention by a course instructor. In BEST an unlimited number of definable roles can be created, allowing specific editing and access rights to a defined role. For example, a group leader role might be allowed to edit quizzes, open forums, or assess reports. In an LD "play", actors assume roles and sub-roles around the generic types of "learner" and "staff". The LD specification does not limit editing rights in roles, however LD tools which separate editors and players would presumably not be able to do that. In the LD specification, roles are more complex, with multiple roles and conditional roles possible. From a teaching perspective, the eventual aim in any learning design tool is to allow instructor/facilitators to assign virtually any non-administrative role to a learner. Learners will become tutors of other learners and need powers to assess, plan, and manage their groups. Pedagogically, many Moodle educators strive to create a learning environment for students where they get choices (and the freedom to make mistakes). This requires tools that support students with self-monitoring tools (mirrors) covering processes like self-planning, time-management, reflection, re-planning, choice in difficulty level of the activities. LD must thus allow students to play the design role, giving them editing

rights, not just playing rights. A consequence of BEST pedagogy is that educators play less of a design role, and more of a facilitator or coach role. It is a complex and heterogeneous process. Complex arrangements cannot be designed without describing and specifying the details and combination of the details of the coach role and the self-coach role.

Finally, the composition of groups within BEST/LAMS is evolving. Student-centred, project-based, and socio-collaborative learning practices place greater emphasis on group-based configurations of learners. The act of group formation may include self-organised, teacher-assigned, or automated assignment according to project interests. Multiple, simultaneous groupings are a necessary requirement as each learning unit has its own collection of groups, each of which may overlap in time. Moodle's group function is for a course-wide, single configuration, useful for defining cohorts that do not change during the term of course. In the BEST/LAMS, the group functionality is based on "role-concept". In BEST/LAMS we found this approach to be less intuitive and extended the current LD specification on groups.

Different architectures integration

One of the most striking features of the Moodle design approach is the ease with which course materials can be developed and refined in an iterative fashion. By contrast, the current implementation of WeLOAD with Coppercore distributes a UOL in a fixed form, and not altered while instruction is in process. This may be related to two differing approaches to BEST development in learning design: top-down and bottom-up (Britain, 2004). We followed top-down to be BEST compliant so that LAMS and WeLOAD can exchange UOLs. However, with a bottom-up approach, we had a chance to do more creative things and may help refine the specification. A fixed learning design process is useful in some situations, in other situations it may be difficult to adapt the UOL to handle unforeseen circumstances (either emergencies or unanticipated pedagogic opportunities), particularly when they occur after instruction has begun. We discovered that the learners in an introductory educational technology class had a strong interest in weblogs, and the ease with which Moodle allowed them to adapt the in-progress course to place more emphasis on weblogs.

The "engineered" LAMS UOL runs, package and "evolved" BEST real-time editable configurations represent a major difference in design philosophy. Moodle allows technically-native instructors to create useful learning scenarios almost immediately, and then progressively refine them as their skills improve. This may be a critical factor in Moodle's popularity with teachers. The results of our group's ability to operate BEST LD tools were mixed. One group member found LD tools such as the combination of WeLOAD with BEST require much more front-loading of skills before useful results can be achieved, and iterative development was inconvenient at best.

One important strategic question for BEST/LAMS during that integration was "If it is likely that the average teacher will be uncomfortable leaving the familiar BEST environment to author a unit of learning with a separate BEST/LAMS tool, then several other strategies would be considered. On-the-fly creation within BEST, with a subsequent generation of the LD specified format via an internal BEST process seems like a more appealing option. **This is a "template editor" that would support the creation of more course formats that support roles and conditions.** Thus for a BEST course/UOL to be LAMS LD compliant, a way of "capturing" an end state (and stripping the user data) will need to be developed. An improved XML

export system for BEST that support LAMS LD functionality and specifications may prove to be a not so difficult way to maintain the design approach.

Topology

The structure of an LD manifest can be represented by the specific type of directed acyclic graph (PeU v.2.0) known as a tree. The mathematician and architect Christopher Alexander (Alexander, 1965) has argued that socially constructed artifacts, such as cities, cannot be adequately represented by trees, but instead are better represented as semi-lattices. La Porte, et al (1975) suggest that this phenomenon may hold true for other types of social organization, not just cities. We represented a structure as an XML-tree, and used XML-procedures to read that tree iterative. EML is that give us powerful approach.

LD UOLs are distributed as fixed tree structures, limiting transitions and relations (PeU) to only those paths that were anticipated when the UOL was designed. By contrast, the relationship between BEST objects is fluid (which, of course, has its own set of advantages and disadvantages). In addition, we must consider non-structured situations (such as in a face-to-face class or in social chat/forum) where functions have been carried out through "unofficial channels". Indeed some have argued that more effective learning can take place this way than through the formal curriculum. In the LD concept, itineraries and conditions can be set up to use the same resources in different ways depending on an individual learner's profile, path, and decisions made throughout the course (PeU). Still it is unclear how unstructured group negotiation will be modelled in the LD specification (by defining the environment in which these unstructured negotiations are facilitated)

The topology of LD is the XML schema, the UML (or EML) representation, the content package (SCORM/IMS) or the LAMS LD tools meant appears to represent a major impedance mismatch with the current design of Moodle. BEST take up the challenge these issues to be compensated for without drastically altering either Moodle (to force compliance) or LAMS LD (to allow richer topologies, and a greater degree of interconnectivity). This is extremely problematic for tight integration of Moodle and LD; it may force any Moodle support for LD to be as a sub-module, rather than LD becoming an integrated function of the Moodle core. A Moodle course author has a high degree of freedom in organizing course materials, activities and resources. Also, the power and flexibility of the programming languages underlying BEST- PHP, XML, EML and Java, allows educators-developers to continuously extend the capabilities of the BEST in unexpected and creative ways.

We give several options to integrate LAMS (or PeU) LD into BEST:

a) By changing the export and import format of the current adapter.
b) By including a viewer, like the SCORM/IMS implementation of BEST
c) By including a viewer *and* integrated editor in BEST (however this will compete with the current editor and viewer, so not advisable)

LD tools integration tests

There are several IMS LD related tools currently available:

a) engines;
b) editors
c) players.

Here we considered potential integration and usage of these different kinds of tools with BEST

LD Engines

CopperCore (Vogten and Martens, 2004) is an engine which implements all the levels (A, B, C) of the IMS-Learning Design specification. CopperCore is currently the only LD engine available and has been extensively tested with a set of examples on Levels A and B (LN4LD, 2005) and conforms perfectly to the LD specification.

LD Editors

Table 2 provides a list of five available LD editors. LD -Compliant Editors (May 2005)

Nr.	Tool Name	Link	Author	Levels
1	CopperAuthor	www.copperauthor.org	OUNL	A
2	Reload LD Editor	www.reload.ac.uk/ldeditor.html	Reload	A,B,C
3	ASK LDT	www.ask.iti.gr	University of Piraeus	A,B
4	Mot+	www.licef.teluq.uquebec.ca/gp/eng/productions/mot.htm	University of Quebec	A
5	Cosmos	www.unfold-project.net:8085/UNFOLD/general_resources_folder/cosmos_tool.zip	University of Duisburg	A,B

LD Players

There are several LD players available: CopperCore Player, Reload LD Player (Bolton, 2005), SLED, and Edubox. The CopperCore Player is a working prototype to demonstrate how UOLs run, to check internal functionalities, and to publish instances, roles and users to the engine. We note the user interface is not very user-friendly. The second player, Reload, has just been updated and offers better support than the previous version for several elements and learning structures of IMS LD. It still does not implement all the LD Levels and features but its developers are continuing to work on it and they are confident they will achieve full conformance very soon. As was the case with the CopperCore player, Reload can be used with Moodle as an external web player. SLED is developed under the JISC eLearning Framework. It has delivered an open source player version that integrates services and further development is continuing at the moment. The Edubox player is a full featured EML and LD player that is used at the OUNL as part of their infrastucture. It can import/export LD through Educreator but it is not usable for small scale deployment because it can only run on large Unix machines currently.

LD-Related GUI-based Editor/Players

Two drag-and-drop GUI-based editor environments were discussed in this study: LAMS and elive LD Suite. Elive LD Suite (2005) is not yet available for testing but was described as offering an intuitive GUI-based sequence-editing environment. LAMS has been publicly released and was examined for this report. LAMS (the

Learning Activity Management System) is a software system based on the concept of LD theory which has been in use with teachers and students since mid 2003 (Dalziel, 2003) . It is an LD-inspired tool for designing, managing, and delivering online collaborative learning activities. It is important to note that the creators of LAMS do not see this platform as a competing learning management system, but rather as an activity/UOL authoring tool that could be used in conjunction with many LMS. LAMS has an intuitive interface with a visual authoring environment that allows users to create sequences of learning activities with very little effort (LAMS International, 2004). Although it is not LD compliant, LAMS is based on LD principles and it intends to be LD Level A compliant by July 2005. The LAMS team has pointed out some problems with IMS LD that made it difficult for them to implement an intuitive system under specifications (Dalziel, 2005). Table 3 shows a summary of the capabilities of all tools mentioned in this section.

Table 3: Roles and Capabilities of LD and LD-related Tools

Package Name	LD engine	LD editor	Non-LD editor	Drag/drop editor	LD Player	Administration
CopperCore	NO	YES	YES	YES	NO	NO (API)
CopperAuthnor	YES	NO	YES	YES	YES	YES
Reload	YES	NO	YES	YES	NO	YES
ASK LDT	YES	NO	YES	YES	YES	YES
MOT+	YES	NO	YES	YES	YES	YES
Cosmos	YES	NO	YES	YES	YES	YES
LAMS	YES	YES	NO	NO	YES	YES
Moodle	YES	YES	NO	YES	YES	NO

At the moment, LAMS is one of the most immediately useful tools for the Moodle and BEST because of its ease-of-use and the willingness of the educators-developers to adapt it into the BEST. According to recently published development roadmap projections, Moodle (v.1.6 development - v.2.0) and prototype BEST intends to integrate LAMS as either a new course format, a new activity module and both in BEST as a step towards eventual LD compliancy next version of BEST.

Activities/tools in LAMS are similar in function to BEST activity modules. BEST activity modules include forum, chat, survey, choice, assignment (including journal), resources, grouping, glossary, lesson, wiki, messaging, and optional modules such as book, database, and questionnaire. New LAMS v. 1.0.2's activities are similar, including forum, chat, journal, survey, voting, submit files, share resources, grouping, resource and forum, Q&A+Journal, Voting+Journal, Chat&Subscribe, and Chat&Subscribe+Journal. BEST has many other activities in development (for example: blog, database, project, document management, object module, WeLOAD module, book module and etc.). The number of activity modules in Moodle and BEST are greater than in LAMS, but both sets are capable of building a Rich Collaborative Learning Environment (RCLE or complementary). The main difference is that a LAMS activity was built to be "Learning Design aware", while a Moodle activity is not. With LAMS, educator can create a sequence of activities and set the order of activities. Then the created sequence is saved in a private or public repository. If an author needs to modify some aspects, it can be reloaded from the repository and changed. In addition, there is a special kind of activity in LAMS called a Parallel Activity (Ghiglione & Takayama, 2005) which allows a single person to

conduct two streams of activities concurrently on a single screen. We list such activities here: Resource and Forum, Q&A + Journal, Voting + Journal, Chat & Scribe, Chat & Scribe + Journal.

The case of embedded resources was the easiest for BEST/LAMS interaction. We put LAMS inside BEST as a resource (a link to a URL). Of course, LAMS and BEST have already had the same session so that we have no login problem (in BEST we nave not to have login twice). Interoperability interaction was more difficult because Moodle 1.x was designed with no "Learning Design" framework in mind. Therefore, it is hard for Moodle to interact with any UOL. At the moment, LAMS exports/imports a sequence of learning activities under its own format. Obviously, LAMS cannot use the course data of Moodle and last one cannot understand a sequence of LAMS. This, of course, is the reason interoperable specifications such as IMS LD is needed. Finally, in the case of activities interaction, we found that activities of Moodle and activities of LAMS cannot exchange data or re-use one another because they do not have a common interface for interaction.

LAMS 1.1 will have a tool for creating new learning design tools, such as project managers or combined wiki-forums. This tool-builder will interact with the LAMS core (called the "LD engine"), presumably auto-generating Java code. Until now, new tools had to be created by manual coding. In contrast to Moodle, BEST benefit with a similarly modeled tool-generator for PHP that produces LD-compliant tools. This helped us to create new activities for BEST more easily and as a result, BEST has richer online learning environment based on LD than Moodle. Finally, the prototype BEST has been focusing on integrating some popular open source software (Bodington, LAMS, AMSTOIA and WeLOAD) using a WebAuth single sign-on mechanism (Noble, 2005). In BEST/LAMS the two systems interacts with other systems easily (such as WeLOAD). BEST was adopted this kind of capability.

While these options of *external* tools may be useful in the short run for integration of LD and IMS packaging into BEST, a second question is how strategically the BEST code could integrate LAMS *internally*. Similar to the SCORM/IMS integration in BEST, we did the following:

a) We created an export filter that is LAMS compatible. This allowed the transport of BEST courses to LAMS.
b) Import filter that can read the BEST/LAMS application profile (so files that are exported with BEST have been created with external tools that are compliant with the BEST application profile)
c) LAMS viewer (similar to the SCORM viewer) that can view any imported LD file that is not conforming to the BEST application profile has been included.

In prototype BEST these questions have been resolved. Yet from a educator's point of view, as stated earlier, it would be far preferable to achieve this internal integration, to provide a seemless working environment for a educator.

4. The BEST Model of e-Pedagogy

An important element, realized in **BEST**, is the possibility to ***model the learning methods*** using a wide spectrum of learning activities (included in the learning process model) and using interpretation and assessment of the results of the learning activities as events that are able to influence the virtual process.

A main objective, resulting from the new approach to the design and creation of e-learning environments, is independence from the application field – studied subject field, learning activities, form and mode of learning, educational necessities of the learners, learning and teaching methods, etc. The environment should provide support of the virtual e-learning process during the whole life cycle – from definition of the learning objectives and construction of electronic courses, accompanied by learning activities (learning, testing, examination, consultation, team work), to grading of the results and the educational quality.

Learning content and its corresponding electronic materials (which are actually static) are just elements of the complex *virtual learning* process, characterized by dynamics and variability, adaptation to specific learners, asynchronous or synchronous inclusion/ exclusion of different users, subjectiveness and objectiveness of the grading and graduating procedures, etc. The *virtual learning object* in principle may not be related to the learning content but may consist only of virtual learning activities (e.g. communication between learners and consultants, forum discussion, etc.). A significant difference between the new approach and the previous works lies in the modeling of the learning process (including the participating subjects and objects) and the interpretation of the different viewpoints (e.g. the viewpoint of a teacher, a learner, a guest and so on). For example the grading of a learner's progress, viewed as an event (a result from virtual learning), can change the consequent development and adapt it to the necessities of the specific learner. The philosophy of the new approach, in short, is in the following: the learning process doesn't consist only of ''absorption" of learning content, learners that are not active in the learning process don't learn well; therefore the adequate modeling of the process in ELE, in all its completeness and variety, is crucial for the success of the e-learning.

Examples of ***elements and models*** that are used in the realization of the designed system **BEST**: metadata and ontology for representation of the knowledge in the subject domain (SD); model of the learning process for the studied SD, including models of learning activities, learning materials, learners, teachers, etc.; intelligent support to the process of creation of learning materials and tests (including multimedia tools, automated linguistic processing, test generation, etc.); cooperation during support of learning and teaching, etc. In addition we will create modules for: *learning course generation* (using a specified learning objective, subject field in the terms of the studied concepts, learner model and learning resources in an integrated database and Internet), *Web presentation of learning courses*; *conversion to standard formats* suitable for export to other ELE and conversion of e-books to browse autonomously; *additional information* (multilingual dictionaries, general and specialized explanatory dictionaries, links to virtual libraries and other electronic resources, etc.); support to the work of learners and teachers in the learning process (*software tools* used for example to create and solve problems, to write homeworks, to construct texts and so on).

***Main functionalities of* BEST**:

- *Modeling* of specific learning processes in different subject fields, wide spectrum of learning activities and subjects participating in them;
- *Administration and interpretation of created models*, and simultaneous (parallel) dynamic support of virtual learning for multiple users (learners, teachers, administrators, etc.) based on the created learning models and on the subject fields;
- Support of dynamic *virtual interaction* between the subjects and the resources of the system, provided by a model of the corresponding learning process and an integrated database;
- *Virtual communication* using activities related to the learning content (communication, information exchange, team work, and so on depending on the dynamic model of the learner) using different technologies and tools (forums, e-messages, videoconferences, etc.);
- Application of different *pedagogical strategies for learning* (depending on the specific user necessities, and with possibilities for automatic adaptation of the strategies based on a model of the acquired knowledge – before and after the implementation of a specific learning activity), etc.

In particular, *the learners* could choose the set of topics (located in the corresponding SD ontology) independently, could receive e-learning in form and content suitable for them, could be grouped according to similar educational necessities and/or models, or could be grouped for team work, etc.

BEST implications

BEST is integrating Learning Design standards. Currently, prototype is compatible with IMS-LD specifications. However we fully integrated with LAMS as either an activity, course format, web-services, database and etc. BEST preliminary supports IMS-LD Level **A**, allowing import and export. We integrated repositories such as Object module, WeLOAD, LAMS repository and etc. Finally BEST provides complete support for the IMS-LD standard, conditional activities (such as these in PeU v.2.0), and groups/roles customization at BESiTe, course, and activity level. Along with this there are several implications for BEST on this pathway: 1) bricoleur tooling, 2) UOL-style authoring, 3) XML code output, 4) roles/conditions/paths, and 5) goals for LD levels.

Maintain bricoleur (Frenchword) **tooling**

The French word bricoleur is as "handyman". The pedagogic sense of the word was introduced by Turkle and Papert (1992) which grew out of an earlier use by Levi-Strauss (1962). The idea here is that there are two fundamentally different ways of approaching a problem. The "engineer" way involves making careful plans and writing everything down in full detail ahead of time. The "bricoleur" way is more of an organic process of iterative design and refinement. While each approach is useful, the advantage of software designed with bricolage in mind is that the users can start producing useful results immediately. BEST as Moodle 1.6 based system is an excellent example of software designed for bricolage. A naive (or even

technophobic) educator can start doing useful things in BEST with five minutes of instruction. Seeing an immediate positive result is a powerful motivating factor. There seems however to be no fundamental reason why LD could not support bricolage by altering the LD XML tree while the code was running, similar to the way you can use DHTML to alter web pages that have already been loaded. This kind of procedure is what tools like CopperCore can support. Consequently, if it is technically possible, we would favor the development of LD tools that support this work style (preferably internal to BEST so that an environment familiar to users can be preserved).

Create UOLs from structured sets of resources, activities and services.

The Moodle interface is presently organised like a stack of "cards" laid out vertically down the screen. Each card is a square box that represents a week or a topic. A card typically contains a title and some activities and/or resources. Even though a Moodle card is an almost self-contained "piece of learning" and can represent rather complex learning scenarios, it is organized as a rather simple flat structure. The title, activities and resources simply appear one after the other without any other kind of link or internal connection that could provide additional structure or relationships among the different elements in the card. This structure is the most fundamental difference between the central elements in BEST's UOL, and a Moodle "card". In a UOL, all of its parts are formally related to one another. A BEST's UOL typically involves resources and/or services sequenced or linked to each other in some conditional relation way (PeU v.2.0). In contrast to the flat structure of the Moodle cards, where all activities and resources are visible in the same way for all users, BEST's UOLs involve layers deep of non-visible activities and resources that can be also sequenced or visualized in different ways according to the roles assigned to the different users. In Moodle, as we said, the unit is flat, with no hidden activities behind a title. The title itself is just a label. It cannot hide or pull along any associated parts with it by dragging and dropping.

In contrast to Moodle in BEST an richer structure to its cards have been added. In other words BEST differ from Moodle mainly by its richer structure of an LD UOLs within its courses but also allowing the option of unstructured elements or components contained in a course. Likewise, it should also be possible to export an entire Moodle course as a UOL. UOLs is an additional type of building block in BEST, next to the traditional flat cards, which the educators or course designer would have available to construct a wide variety of learning scenarios (non-linear such as this in PeU v.2.0). The complexity of this kind of design, however, would require a new authoring interface, such as the drag and drop tool developed by LAMS (and PeU v.2.0). These movable, swappable cards/units would then be the core objects exchanged in a national BEST repository that is LD-compliant.

Generate XML code from BEST designs after-the-fact

In BEST an 'after-the-fact' tool that builds an XML model after an educator designs and implements a course. This 'capture' a model/scenario after the learning has taken place. As a course progresses, the LD tool (LAMS) analyzes the online patterns and produces an XML model. In addition, a manual editor could then add the face-to-face aspects to the model. Currently in Moodle, there is a basic process happening like this already. Behind the mask of the zip-backup is a non-documented

XML-tree. In BEST that tree is reworks in areas such as fully compatible with LAMS automated updating of resources. Moodle tends more toward what the authors characterize as 'server-centered' rather than 'manifest-centered' as it is in BEST, though there are some aspects of Moodle that are reminiscent of a manifest-based approach, in particular the XML format used for backups. Backup format in BEST is more LD-friendly structure (realized through an XSL transformation). This, however, is a fixated state of a course at one point in time. That has been useful for exchange.

Adding multiple, definable, conditional roles

In BEST were implemented some additional definable roles, and it has the capability to incorporate multiple different roles, conditional roles and temporary roles. One goal is to create an intermediary role between educator and student—such as "tutor" with limited teaching permissions. Mentor role has been defined too. These roles are at the site level, course level, and activity level and allowed possibly of multiple roles within the same course. However, it appears that the LD concept in LAMS can go further with "multiple" roles. We assumed several simultaneous roles in a BEST course. Another concept is conditional roles. A student would automatically be given a different role when certain conditions are triggered (PeU v.2.0). This operation is much like moving up to the next level in a game. This was done by extra fields in user tables to store temporary role flags (during a course) and longitudinal flags (preferred learning style), and even the combination of these flags. That process was easy, but the difficulty would be implementing the engine that evaluates a script against these roles.

Aim for LD Levels A, B, C

At least two points should be considered regarding LD levels. First, LD levels are a distinction for implementers, not users. They are levels of the effort to implement the related functionality, not levels of the complexity of the learning designs that are created with a tool. This can result in situations where one has rather simple learning scenarios (from a educators point of view), but these cannot be implemented on Level A, because, for instance, certain properties are required. Second, when someone decides to start with a Level A implementation, this should be done with Level B and C "in mind". The implementation of a LAMS sequencing mechanism in terms of "acts", for instance, will vary considerably depending on whether we plan to extend it in the future with LAMS sequencing triggered by properties and conditions (PeU v. 2.0). Furthermore, it looks very likely that Level C (notifications) will be necessary whenever an LD UOL has to be able to communicate with BEST/LAMS integrated database (e.g. for Gradebook purposes). There is also a limit as to how much complexity can be reduced when the views and needs of the different educators and learners in Bulgarian educational institutions are considered. For this reason, implementation of all the three levels should be our goal from the outset.

IMS Learning Design implementations in BEST

Creating the universal learning design protocol, Learning Design is in process of development. Educator-developer is eager to contribute to this development because of his enthusiasm to deal with an inter-LMS exchange system. In this section, we

outline some implications for the development of Learning Design from this potential educator-developer perspective as LD moves to become more widely accepted as a language of exchange (EML as a communication in BEST/LAMS). We separated experimental data on three levels, theory of LD, specifications of LD, and finally the experimental data with LD tools. It is perhaps overly audacious on our part to suggest changes after only a few months (October 2005- March 2006) of immersion, so we accepted the apologies for any incorrect assumptions or immature understandings as we try to grapple with the intentions and concretions of LD in BEST.

Current conceptual framework in BEST

The conceptual framework of Learning Design is powerful and appears to hold the core requirements that BEST users will expected. It goes beyond single-learner-in-isolation standards, such as SCORM, to include collaborative knowledge model of learning with flexible roles in BEST. The eight principles defined by Koper (2005, p. 19) can be summarised as:

* LD must be comprehensive: including objects, services, activities, roles, solitary/group models.
* LD must support blended learning: face-to-face integration as well as pure online learning.
* LD must be flexible: supporting all theories of learning, pedagogically neutral.
* LD must describe conditions of learning: tailoring the design to specific learners or situations.
* LD must stimulate reuse: portability, arrange-ability, addition/subtraction of parts.
* LD must be standardized: operate with other standard notations (i.e.: IMS-QTI for adaptive tests)
* LD must be automated: provide a language for automatic processing
* LD must be abstracted: for repeated execution in different settings and people.

Pluralistic design philosophies in BEST/LAMS

While these core requirements provide an excellent framework for exchange of learning, questions have been raised as to the design methodology of specific BEST LD tools. In other words, while the LD specification aims to be pedagogically-neutral, the LD-tools may prescribe a particular design methodology. Implicit in design of any learning activity is an epistemological question about the nature of design. The nature of design has been classically conceived in a "pre-engineer and run" paradigm. Diffusion models of innovation (Rogers, 2003) operate in a similar way. First, an innovator constructs a new design, and then the design is disseminated. In contrast to this, there is a translation/transformation model of innovation in which designs are co-created by environments and actors in a way that continually transforms the network of actions (Law, 2004). The properties of the design itself are actually less important than the reconfigured network of actions and the very process by which this network of actions and relationships is reconfigured in a learning community. This community-based, ecological paradigm of learning may be a theoretical concern that LD will need to wrestle with. Moodle itself offers only three pre-engineered formats (topic format, social format, and weekly format, yet within the topic and weekly format it not necessary to pre-design any aspect of the

course. In contrast to Moodle, formats in BEST are plugged with new formats such as the Project Format and the **Sequenced-Activity Format** (new **SAF** in BEST/LAMS).

The design-on-the-fly ability of the Moodle LMS was a critical attribute that no one was willing to part with. We considered **freedom *from* design is as important as freedom *in* design**. In other words, it might be productive to distinguish between different types of 'design'-- a conscious/explicit process of design and an unconscious/non-explicit mode of designing and compare LD tools through those criteria. The ability to design unconsciously is an inherent and useful practice that is embedded in the daily routine of teaching. In some ways, Moodle emulates this non-explicit design. The ability of LD tools to offer similar freedom may have to do with their design philosophy or current stage of development.

Learning Design (LAMS) into Collaborative Learning (Moodle) or b-Learning (BEST)

The critical question that raised was whether LD is sufficiently developed to handle all the social dimensions of learning at all??? For example, we noticed that two LD-related tools, LAMS and elive LD-Suite, had found it necessary to handle the complexity of groups in learning. These two tools used runtime extensions to manage group functions. LD may need additional specifications to integrate and manage runtime aspects better, such as integration of runtime services and runtime grouping. At the moment each tool implementer is free to choose their own implementation. However, in other ways LD appeared to be very ambitious in some aspects of social learning. If LD can accommodate that decentralized kind of learning, it should have little problem with the issues surrounding group organization and operation. In addition, LD seems not to have a specific way to handle forums, but just makes a reference to them, perhaps so the LD package itself is not tied to any specific forum setup. Moodle, for example allows a number of definable properties to forums, and the varieties of group process produced by these configurable rules can and should be modeled. In addition, Moodle has numerous ways of handling unstructured communication, not just for discourse (wiki, blogs, instant messenger), but also for structured data (glossary, blocks, database). New code may need to be written in LD players to make them operate smoothly with any forum-oriented LMS such as Moodle. In BEST prototype this was solved by using web services whenever a tool cannot connect with a run of a LAMS UOL.

Administration and Learning Services (LS) in BEST

Another issue is that it is not always clear where administration ends and learning services begin. Moodle has a rich set of student-monitoring services such as Gradebook, Activity Reports, Block Reports, Logs, and Portfolios that are an essential part of the learning environment. Bearing in mind the current state of development of on-line learning environments, it is not an exaggeration to say that the usefulness of most UOLs will depend more and more on the appropriate integration and configuration of these types of components. Integration of the BEST's activity modules and activity reports has influence of educ ator's coaching of students demonstrates that many "administrative services" in the learning environment have an impact on the success of learning.

WeLOAD integrated in BEST (IMS-LD, IMS-DRS, IMS-LIP)

The task of UOLs exchange and WeLOAD and Learning Objects Module repositories is very important. Presumably, this issue was dealt with outside the formal specifications of IMS-LD to the Digital Repository Specification, Learner Information Package, and Metadata specifications (IMS, 2003). For educators, however, the exchange of units (LAMS sequences), learning objects (SCORMs/IMS packages), and courses (archived) is one of the main reasons for integration of a tool such as WeLOAD into BEST. This exchange was our starting point for proliferation of LD UOLs, then it is imperative to outline the **course/UOL** metadata used for searching and define minimum standards that repositories can operate under. Thus IMS-LD, IMS-DRS and other specifications need be presented, discussed and implemented concurrently in order for this specification to be intrinsically useful to the teaching community. By focusing on the end goal and providing workable, searchable Bulgarian national repositories, BEST/LAMS will be a powerful incentive for adopting interoperable standards. Thus, tools for extracting, exchanging, and reconfiguring UOLs and course files gives the best autonomy, productivity, compatibility because those BEST tools can create a demand among educators for **exchange** within the LD standard.

BEST/LAMS GUI-based LD Tools

The number of LD and LD related tools is growing rapidly. BEST/LAMS is an intuitive tools because educators can create and exchange a sequence of learning activities by dragging, dropping and exporting to repository of UOLs. Most other tools (i.e. Coppercore, Reload, WeLOAD) are designed for users who are familiar with IMS LD concepts (play, act, role-part, etc) and may be more suitable for educators-developers and designers than for the average educator. LD tools should be more intuitive and easy-to-use so that non-technicians can use them to create and exchange UOLs.

Conclusions

The new approach discussed here changes the traditional e-learning notion, in the centre of which is the learning object (material) and puts a focus on the conception of learning represented by activities (that compose the learning process viewed as a management process). The specific model of a management process includes flow structure of the learning activities (with possibilities to branch, including a possibility for subjective choice), resources for organization and implementation of the learning activities, management and control tools (including assessment of critical for the process events, stages and acquisitions of subjects) and so on. In this models it's possible for results from the implementation of a learning activity to determine consequent development of the process, e.g. to lead to different learning scenarios including adaptation to a specific learner.

This paper points to that the integration is not only technological activity but brings up a mater about new e-pedagogy in LMS/LD complementary systems. The complexities of integrating the Learning Design concepts, specifications, pedagogy, and tools within an LMS/LD complementary prototype called BEST take us new kind of people called **educator-developers**. We have attempted to view the two from a pedagogical point of view and technological consideration because it is not always

possible for us to avoid certain presumptions. The section on essential differences compared BEST and Moodle in its current structure of units of learning, the contrast between bricolage and engineering, and its underlying topology. Section three examined current LD tools and found that the full BEST/LAMS integration was far closer than we imagined.

The implications for BEST were outlined too. In BSET social architecture consciously preserves its intuitive structure for designing courses. A post-run capturing of LD-based XML schemas were achieved both into BEST- LD compliance and bricoleur design. Multiple roles in a structured UOL, with conditions, concepts, relations and paths, are implemented as new pedagogical modelling approaches. In BEST/LAMS will be used different types of web services or technologies such as Ajax to rapidly allow for a deeper, smother integration.

The current conceptual framework has been described. It was very appropriate for modelling education in BEST. It was expressed that bricoleur-style design philosophies, collaborative learning complexities, and comprehensive learning services be well accommodated. Finally, in LD tools it had been supported concurrent development of LD repositories (WeLOAD, Learning Objects Module) to provide demand for the exchange of UOL. In addition, it is important to promote intuitive design environments that are educator-friendly.

The process of integrating LD initiatives is already underway.

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