DESIGN OF A WEB-BASED LEARNING MODEL: SHIFTING THE ACCENT FROM KNOWLEDGE TRANSMISSION TO KNOWLEDGE CONSTRUCTION

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Abstract
The aim of this work is to design a web-based learning model using learning techniques based on knowledge construction in order to increase learners' competency in higher education.

Since knowledge is under a change as a result of improvements in the technology, the learning approaches that levitate around students' learning activities could be considerably improved by web-based learning environments that switched education from knowledge transmission to knowledge construction. In addition to the development of learning patterns, educational technologies are constantly expanding. Changes produced by universities, course content, quality assurance, educational leadership, cultural and ethical occurrences have to be considered in the development of web-based learning in order to meet their requirements. But even now, much of the web-based learning environments are accomplished without embedding pedagogical considerations based on learning issues and learner-centred paradigm.

This paper analyses and states the principles that could be implemented in a web-based learning model relying on the combination of various aspects of e-learning strategies, pedagogical insights, as well managerial and technological techniques. The key point is the cognitive change that shapes learning behaviour from simple information transmission to a constructivist way. Acting as a present-day educational framework of approaches for effective web-based learning, the research presents a set of steps following the exploration of instructional context concerning learning theories and pedagogical principles of the web-based learning paradigm.

The approaches investigated by this research are settled on the base of specific references, European recommendations, theoretical researches regarding the vision of web-based learning environments, and literature relevant case studies. The paper proposes that, as a part of the shared technology environment, more attention need to be concentrated on developing and reinforcing the collaborative and constructive web-based learning system in higher education. As well, the author brings out the lack of the researches regarding web-based learning applied in higher education of the Republic of Moldova and proposes a particular and modern web-based learning paradigm.

Keywords: *web-based learning, knowledge construction, collaborative learning, constructivist approach, web-based learning paradigm.*

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1. Introduction

Nowadays web-based learning (WBL) represents a meaningful method to acquire knowledge and skills by applying web technologies and tools in teaching practices. Essentially, web-based learning is treated under different interchangeable concepts as e-learning, computer-based learning, technology-mediated learning, etc., the meaning and basic principles of them are being the same. According to the paper "eLearning - Better eLearning for Europe" (European Commission, 2003), the use of the information and communication technology (ICT) is not in itself the goal of e-learning; e-learning has become shorthand for a vision in which ICT-mediated learning is an integral component of education processes and systems. Further, within the specialised literature, e-learning is recognized in the role of the learning on the web or the learning distributed mainly online.

E-learning types allow students to access learning materials and multimedia packages or to join courses by using ICT. The web-based learning environment could consist from a learning management system till of a large number of programmes and tools, like online degree programmes, joint online learning courses, Massive Open Online Courses (MOOCs), blogs, social networking, videoconferencing applications, messaging, voice communication. In short, skilled learners could widely use a mixture of programs in the virtual world to complete their tasks and solve their problems.

The experience of implementing a WBL via relevant systems in the last years demonstrates great benefits for the teachers, students and academic institutions. Yet, the topic of how to develop principles or benchmarks to ensure the quality of web-based education is still new.

One of the initial studies produced by The Institute for Higher Education Policy, USA, designed the quality assurance benchmarks including such topics as course development, faculty training, student services, learning resources, infrastructure, and outcomes assessment (Phipps & Merisotis, 2000). Also, in the last decade, in order to underpin better use of ICT in the context of adult learning The Renewed European Agenda for Adult Learning (2011) defined the focus for new technologies "as a means of widening access and improving the quality of provision, e.g. by exploiting new opportunities for distance learning and the creation of e-learning tools and platforms in order to reach new target groups, in particular those with special needs or who live in remote areas". The study "European Exchange Mechanisms for e-Learning Content and e-Skills Development" (2010) specified the need to support at the EU level the activity of "*promoting better and greater use of e-learning* by: promoting the development of courses and mechanisms facilitating the exchange of e-skills training resources; supporting the networking of e-learning and training centres with the European Network of Living Labs and promoting successful e-learning strategies".

Generally, the effective integration of the web in education is a complex, multi-component process, involving not only the initial capital for technologies but organisational and managerial, curricular and pedagogical aspects, learning theory approaches and issues as well.

2. Background

2.1. Research goal

Integration of web-based learning and knowledge construction applied in higher education is a process not sufficiently developed in the Republic of Moldova, that's why it needs to be carefully

reviewed. Moreover, there are still a number of issues that restrict the use of e-learning throughout Europe as stated in The European-wide e-Learning Recognition Review Report (2015).

The study represents a theoretical research on designing a web-based learning model by using various aspects. The accent is on the elements that could be implemented in web-based learning relying on the association between e-learning strategies, pedagogical insights, collaborative learning techniques and organisational states. As more examples of these systems are elaborated in educational scenery, web-based learning will become an important part of the large spectrum of teaching activities and managing responsibilities, with particular attention to higher education. A literature review was undertaken to analyse the condition of research in the field of web-based learning. Then, a conceptual framework was developed based on the literature review in order to introduce the value of web-based learning in higher education. The paper is not giving empirical findings from larger research into web-based learning.

2.2. Literature Review

The study explanations regarding web-based learning features are connected with the general framework which supports the WBL design process. The development of web-based learning environments has affected the educational structures that support distance learning and lifelong learning programs by matching a large range of academic tools with digital communication technology. Learning processes organised by means of the web assist mostly a personalised and self-directed process of learning and enable students to study individually and more rootedly the interest areas. The web-based learning offers significant potential for the improvement of education but it is only a tool, and can only be useful if the educational goals for which it is used are plainly outlined.

Web-based learning is a broad concept relying on pedagogical principles. Govindasamy (2002) states that one of the most crucial prerequisites for successful implementation of e-learning process is the need for careful consideration of the underlying pedagogy, or how learning takes place online. One of the important outcomes of the WBL is the increase of communication and collaboration between teachers and students to exchange and share teaching / learning content and educational practices.

Referring to Cook et al (2010), the term web-based learning encompasses a broad range of instructional approaches (tutorial, asynchronous discussion, live conferencing, practice exercises, cognitive interactivity and presentation blending in with other instructional activities).

Instruction delivered through e-learning is relaying on specific features introduced by Uzunboylu (2006), namely: (a) relevant content stated for learning objectives, (b) using of specific instructional methods, (c) media elements used to deliver the instructional content and methods, and (d) instruction is designed to build new knowledge and skills required to achieve individual learning goals as well as to improve overall organizational performance.

Wang & Jiang (2018) specified that a WBL action takes place within a large learning system that comprises learning management, content management, learning object libraries, and virtual learning communities.

Implementation of online learning is eventually being produced through the management of teaching and learning processes by the software known as Learning Management Systems (LMS) or

Content Management Systems (CMS). There are several environments that meet a set of features for creating successful web-based learning courses, for example: Moodle, TelEduc, BlackBoard, WebCT, Toolbook, TopClass Server, among others (Lopes, 2014). Steps required to install, design, and implement a LMS within an education organisation will cover aspects of software engineering methodology that it is up to a technology specialist.

The biggest challenge of a WBL system, in my opinion, represents the learning framework structured from a socio-constructivist paradigm in order to create flexible learning resources, learning diversity, learning practices and skills within a viable learning community.

The constructivist theory of learning distinguishes learning as a process in which individuals build their new knowledge based on the previously accumulated experience (Komulainen & Natsheh, 2008). The previous experience allows students to define new mental models and concepts and to build up a subsequent experience. Thus, knowledge is no longer passively received, and it is constructed through a process of active learning in which students acquire knowledge, build hypotheses, make decisions, and use their own mental models.

Issa et al. (2014) determined that a socio constructivist model defines three major elements: teaching, cognitive and social presence. According to Guo (2017), learning theories based on constructivist approaches value the student-centred idea, while teachers change from knowledge transmitters into knowledge facilitators who encourage students to learn knowledge construction.

A body of literature on e-learning practises provides a broader understanding and substantial experience of the activities related to pedagogy, the techniques of teaching, involving interactivity, collaboration, and unity learning (Thomas, 2014; Basak et al, 2016; Kahiigi et al, 2008; Hadjerrouit, 2010; Phipps & Merisotis, 2000; Suryawanshi & Suryawanshi, 2015). According to them, utilisation of e-learning environment enhances a modern communication link between teachers and students and ensures knowledge transfer to accomplish student personal learning objectives, as well it supports critical success factors like university support, computer training, qualitative learning resources, web-based technology awareness, ability, and skills.

In a great measure, development of a WBL model is passing through major implementations in terms of pedagogical issues, learning theories' priorities, quality assurance, educational leadership, ethical concepts, and learning patterns, presenting great opportunities previously unavailable for academic institutions in order to maximize their educational potential. These particularities pose a serious challenge to any organisation that supports e-learning technologies taking into considerations significant pedagogical principles of the LMS, managing teaching and supporting the instructional technology based on practical techniques of instructional delivery (Lopes, 2014).

Within the report "E-learning quality. Aspects and criteria for evaluation of e-learning in higher education" (2008, p.39), the model for quality assessment of e-learning comprises ten quality aspects: material/content, structure/virtual environment, communication, cooperation and interactivity, student assessment, flexibility and adaptability, support (student and staff), staff qualifications and practice, vision and institutional leadership, resource allocation, the holistic and process aspect. A combination of all of these aspects is necessary to align in a functional manner by adopting a systematic view and fit all parts in a coherent manner on the basis of the pedagogical philosophy (ibid. p.40).

Among the main features of e-learning systems, flexibility, accessibility, interactivity, constructivist approach, student-centred, the economy of resources, and motivation of students should be paid most attention to.

As a whole, the literature review reveals that underlying the web-based learning role for increasing learning processes demonstrates real benefits and opportunities for learner-teacher interaction and knowledge building. The flexible procedure that supplies e-learning should simplify the administration and management of teaching and learning.

3. A framework for designing web-based learning model

The review carried out on WBL features has led to the identification of the challenges to be faced when planning the design and development of a mechanism for WBL in academic institutions.

3.1. Strategic dimension design

Particular attention to research is to analyse WBL system requirements, thus easier understanding how to design an e-learning environment in higher education. In this regard, some frameworks are reviewed.

A strategic framework for designing WBL system by Asgarimehr et al. (2012) follows the viewpoint of e-learning tackling the aspects of cooperation, overlaps and matches three factors: government, industry and educational system. The authors pointed out the designing of any educational system should determine the mission and goals of the institution because it directly influences the educational system's pattern. Regarding a higher education institution, its framework should design and include the main components, namely education, research, and entrepreneurship. According to the report "An e-learning strategy to promote technology enabled learning in UCC" (2012), the strategic direction of e-learning should be guided by pedagogically-led and learner-centred approaches that gain advantages from the enabling role of technology to increase learning environment and support dynamic capability and diversity across academic institutions.

Tsai' model (2009) illustrates four dimensions of the characteristics of e-learning environments and three core domains (perceived-skill, affection and self-regulation) of student e-learning metacognitive strategies: (1) flexible time and space, (2) indirect social interaction, (3) abundant information resources, and (4) dynamic learning interfaces. He proposed this model to describe how students interact with complex e-learning environments when they are involved with web-based learning.

Grani and Cukusi, (2007) presented the results of the comprehensive study related to the design of UNITE's pedagogical framework that consists of five components: (1) pedagogical framework context, (2) pedagogical approaches, (3) assessment techniques, (4) teacher training and (5) current pedagogical practices implemented in national curricula, and national specifics.

The most complex framework for designing WBL system was introduced by Khan (2001). He described factors that help to create a meaningful learning environment, and put them into eight dimensions: *institutional*, *management*, *technological*, *pedagogical*, *ethical*, *interface design*, *resource support*, and *evaluation*. Each dimension has several sub-dimensions focused on a specific aspect of a WBL environment.

A model by Issa et al. (2014), more intuitive for higher education, is able to create a learning community capable of collaborating at all levels: administration level, program level, instructor level, course level, research level, and student level. Figure 1 exemplifies the correlation between major system's components in a networked learning community.

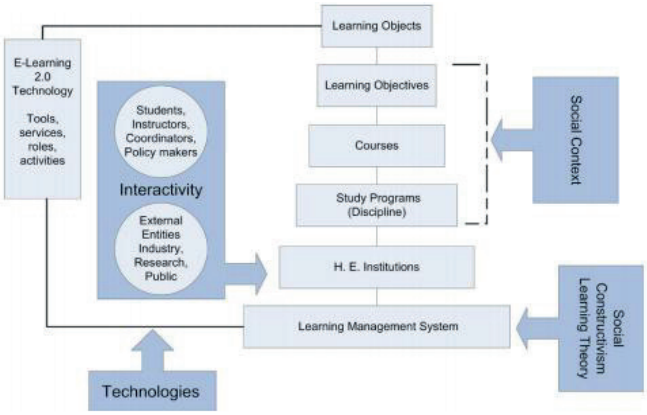

Figure 1. Framework for Networked Learning Community (*source: Issa et al., 2014*)

Taking into account possible combinations of presented models, it could be concluded that principles of WBL make use in case of a pedagogical framework that enables the creation of a set of specific features, which run and guide e-learning scenarios and outlines.

3.2. Constructivism in web-based learning

The principal ideology of learning theories presents learning as a process that helps a person to understand, process, and retain knowledge during learning. Although there are many different approaches to learning, here it is analysed one of the basic type of learning theories - the constructivist approach. Further on, an overview of some of the web-based learning methods assisted by this theory is presented.

Constructivism highlights the value of the active self-involvement of students, thus managing and encouraging personalised learning activities via collaborative learning within social contexts. Kahiigi et al. (2008) specified this type of learning facilitates critical thinking and problem solving, helps build new ideas using previous knowledge and experience attained, and implies students to take on the responsibility of learning by actively participating in the learning process.

Hadjerrouit (2010) analysed the main features of WBL resources that in the pose of instructional content or activity delivered through the Web represent a focused concept, meet specific learning objectives and provide a learner-centred context.

Knowledge construction within WBL refers to the process of developing ideas, attitudes, and beliefs as a way by which a learner produces and links its new knowledge understandings with existing ones. In terms of knowledge building and educational technology, WBL needs to imply the development of learning patterns, the combination of e-learning strategies, collaborative learning techniques and pedagogical insights.

To design effective WBL environments, the university curricula needs to be adapted specifically and every teacher should be aware of what and how students will construct their knowledge. In this context, there are specific pedagogical methods which help teachers become active facilitators and, respectively, students become active participators in a web-learning environment. In my opinion, cognitive constructive schema of e-learning could be transformed into the base of *problem based learning*, *inquiry based learning*, *discovery learning*, and *knowledge building*.

It was mentioned above, a whole range of information systems and processes that contribute to web-based learning is provided by online learning services for students, teachers, and administrators like LMS or CMS. These web-based systems combine managerial, administrative and educational functionalities.

An example of such systems, very popular within Moldovan Universities, is Moodle, a free and open-source Learning Management System that is elaborated to facilitate the collaborative creation of content, organisation, control and to manage the publication of documents in a centralised environment. Moodle contains strong tools that contribute to enhance learning pedagogy and provide a personalised learning environment. Also, Moodle interface and educational design is oriented to *social constructivist* approach of learning. A comprehensive set of interactive tools and activities such as glossaries, choices, assignment, forums, wikis, game incorporated technologies, workshop, quizzes, database activities and others help students to become active learners by discovering and constructing their knowledge. All these interactive instruments are learner-centred. Content delivery could be sequential and linked to each lesson. Every unit could rely on some activities (workshop, glossary, lesson etc.) or assignments that help students work toward finishing the topic unit. Casas (2006) suggested that adopting and weaving constructivism into the course design provide students the opportunities to construct their own knowledge by using their different cognitive abilities to learn and interact with peers, teachers, and students.

In brief, this study specifies that the effectiveness of knowledge construction is a dimension that is crucial to any WBL environment and should be implemented as a unique combination of pedagogical, social and technological components by means of a Learning Management System. Learning environment insured with a range of social activities like group collaboration, seminars and workshops, group discussions and others contributes to knowledge building and discovering. As a result, due to important pedagogical and managerial features many Moldovan higher education institutions have adopted WBL platforms in their curricula to transform and renew the traditional teaching and learning strategies.

3.3. Features of web-based learning

As a result, to highlight features and insights of the designing of the WBL environment, in table 1 a matrix of the WBL particularities based on organizational, technological, pedagogical, and contextual interpretations and statements was summarized.

Inevitably, the complexity of WBL within the higher education context implies transformations of organisational structures and new methodological visions. Over the last years the structural challenges in Moldovan higher education institutions have particularly been assigned to the introduction of technology. To this consequence, web technology has broadly ameliorated knowledge acquiring practices and learning techniques, as well as influenced the barriers of rigid organisational systems.

As-pects	Particularities	Actors' interactions	Description
organisational	– Collaboration network – Group management – Administered lessons – Learning community – Environment for socialisation – Research groups – Sharing teaching and research experiences	University administration and teachers, students, community (stakeholders)	E-learning foresees an organisational framework for systematically analysing student web-based learning strategies. How online learning carries and how students interact with specific learning systems should be the tackle and adoption of a general university procedure that defines e-learning methods used to transform and support teaching and learning processes within the institution.
technological	– Design stage – Software development methodology – using a LMS or CMS as one network – flexibility of user access	ICT staff, University administration and teachers	From the technological point of view, WBL use ICT and Internet services as delivery tools, viz. servers, LMS, CMS, Web 2.0 tools, browsers, e-mail, scripting languages, file transfer facilities, etc.
pedagogical	– Study programs – Learning theories and Metacognitive knowledge – Flexible course development – Pedagogical scenarios – Unified course approach – Learning outcomes – Interdisciplinary thematic topics – Best practices in teaching and learning according to national and international standards	University administration, teachers and students, researchers and practitioners	Learning performance of students is enhanced by taking into consideration that students learn in different ways suitable for the different learning methods of learners. The learning process results from a "thinking struggle" of the students' perception of the reality. By carrying out a significant number of learning activities and participating in interactions to reflect their understanding, students are prepared to gain new knowledge and skills. Hence, the learning style must be differentiated, personalised and knowledge based.
contextual	– Available resource – Multimedia files – Scientific approach – Self-awareness and self-monitoring – Attitude and motivation – Study group interaction and communication – Peer and self-assessment	University teachers and students	The active part played by students to task the information depends on the quality of the delivered context. Also, the amount of knowledge students own has an impact on their learning styles. Students study in different ways and the manner in which information is given out to them influences their capacity to learn. The constructivist e-learning systems should give the students opportunities for meaningful and self-directed learning and for views independent from the teachers and other students and offer chances to experience learning as a process allowing to improve self-efficiency in a specific field, e.g. by setting suitable tasks, by developing active learning and problem-solving strategies.

Table 1. Web-based learning paradigm

According to national educational provisions, in the Republic of Moldova during the last five years, a range of national strategic policies was launched by the Government and Ministry of Education, Culture and Research concerning the ICT implementation in the field of education and the management requirements to address new challenges. These documents mostly specify the national problems regarding the priorities of the growth and extension of the education system of the republic and indicate the lacks in this domain. The Education Development Strategy for 2014-2020 „Education 2020" (2014) (Strategia de dezvoltare a educaţiei pentru anii 2014-2020 „Educaţia 2020"), states clearly that "Limited application of interactive ICT methods and devices for didactic and management purposes does not afford the achievement of quality objectives" and "Communication at school management level is dominated by classical methods of gatherings information through paper-based information, and others. The use of ICT in the management of the education institutions would allow time efficiency and cost reduction. At the same time, it would allow the transparency of the educational process and organise the electronic books, the development and placement of digital contents and home works in electronic format so that they can be viewed by students and parents" (p.22). To ensure further solving and development of the stated problems, the Strategy establishes strategic development directions, here, it is highlighted "the efficient integration of information technologies in education" (p.49). The Code of Education (2014) (Codul Educației, 2014) is aimed at modernising the education system and aligning it with European standards, having the care of learning and teaching, research and development, management, internationalization, employability, student development, lifelong learning, quality assurance, accessibility, stakeholder-academia connection, and others.

As a whole, the national policies have so far concentrated on promoting the level of basic ICT skills among the teachers and students. Nevertheless, web-based learning processes and connected issues are not being discussed yet, and policies centred on specific features required for e-learning implementing have not been designed, the process remaining at the discretion of universities.

4. Practical perspective

The development of digital competence is interpreted nowadays as an important feature in the field of education, training and lifelong learning. One of the six main area of digital competence according to the European framework for digital competence DigComp is to produce and share digital content. Content creation concerns pedagogical aspect of the WBL too. In the context of applicability, DigComp could be used as a practical reference for the flexible course development of WBL.

In some cases, this part of the DigComp may turn out to be somewhat complex to perform, because web-based course design and bulding need to be addressed through various approaches, including pedagogical, administrative and technological ones.

5. Conclusions

The main study goal of this paper was to use the literature and personal experience to develop a framework of decisive elements in theoretical designing of WBL. To this end, the findings of the study highlighted the importance of pedagogical approaches and socio-constructivist learning.

As a result, the next conclusion can be drawn. The main factors that influence the design of WBL are the organisational, technological, pedagogical, and contextual approaches that rely on

interactivity, resource flexibility, collaboration and so on within a web learning platform. This conclusion is suited with features of the conceptual framework and literature review.

However, the paper is not providing empirical results from a bigger research of WBL in higher education. In this case, development of the elaborated framework will be considered within a new research, as well future study should also examine the connections between student online learning strategies and their online learning achievements.

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