4

Methods and Tools for Increasing the Effectiveness of E-Learning

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1. Introduction

In its different forms the e-Learning offers a set of considerable priorities over the traditional teaching: personalized tuition, reduced costs, opportunity for team work, flexibility of the learning material, etc. The evaluation of the effectiveness of e-learning is very important for both - the whole analysis and the improvement of a given system. The effectiveness can be defined by a definite target function, where regardless of its analytical aspect; a given number of indicators are included. Their importance can be defined by appropriate, objectively estimated coefficients' weights.

The right assessment for the rate of importance of the different indicators ensures an adequate rate of objectivity of the whole process of e-learning evaluation. In this chapter method for assessment the effectiveness of e-learning is discussed. It consists of some stages, which are deeply described in the chapter.

The chapter suggests a 3D model which could be used as a tool for increasing the e-learning effectiveness. It also offers an approach for applying this 3D model for increasing the e-learning effectiveness. This approach has methodical value in line with the idea for dynamic adjustment of the individual learning profile of each student in order to increase the personalization level in the e-learning process.

An approach for personalization of the e-learning with preliminary processing and simulation of the teaching and learning process for priori assessment of the effectiveness and transformation of the existed e-learning content towards the individual student expectations is described, tested and visualized in this report. The presented approach has methodical value, according to the idea for dynamically adjustment of the individual learning profile of each student with the aim to increase the personalization level in the e-learning process.

The success or failure of any e-learning initiative can be closely correlated to learner motivation. This chapter presents a method for defining the Students' Motivation in E-learning, which uses the main concepts of the Keller's ARCS Model and the Gagne's events.

2. Method for assessment the effectiveness of E-learning

The implementation and usage of e-learning require large investments of time and money. That is why the evaluation of its effectiveness is necessary to be done. In the last few years a lot of research work has been made in that direction (Todorova & Todorov, 2004; Todorov,

2005; Georgieva, Todorov, Smrikarov, 2003; Hughes, 2008; Sonwalkar, 2001; Todorova & Kalushkov & Valcheva., 2008; Вълчева & Тодорова, 2009).
The quality of e-learning is directly connected with the concept – measurement of the characteristics of the e-learning components.

2.1 Defining a system of indicators for evaluation the effectiveness of e-learning

For defining the efficiency of the different forms of e-learning some groups of indicators have to be defined. These indicators may be used not only for evaluation the effectiveness of existed e-learning platforms but also for designing and implementation of new ones.
In this method the following basic groups of indicators are used (Todorova & Todorov 2004; Valcheva & Todorova, 2005a):

1. Software group of indicators;
2. Hardware group of indicators;
3. Didactical group of indicators;
4. Communications group of indicators;
5. Information group of indicators.

The offered system of indicators is open and its content can be changed and modified depending on the concrete applications and goals of the education. In tab. (1–5) are presented the indicators within each group.

Indicator	Description
1. Personalized teaching	The tools for self-teaching helps the students to study according to their capabilities and free time, to choose the form and the way of providing the material on the basis of their own predilections;
2. Interoperability	To support content from different sources and multiple vendors' hardware/software solutions, the system should be based on open industry standards for Web deployments (XML, SOAP or AQQ) and support the major learning standards (AICC, SCORM, IMS and IEEE);
3. Reliability	To give acceptable results even if there is invalid inputs. The assessment gives an opportunity refusals and situations that involve refusals to be predicate;
4. Flexibility	To exist an opportunity for changes in the content;
5. Portability	To be independent from the users' operating system and to be used by widespread browser such as Internet Explorer, Netscape Communicator etc.
6. Functionality	To be useful;
7. Accountability	The classifying, testing and the assessment have to be automated in such a way that the participants to be distributed according to their responsibilities in the process of learning;
8. Security	The system should selectively limit and control access to online content and resources for its diverse user community;
9. Costs indicator	Measures the costs for purchasing the system, its exploitation and support, etc.;

Table 1. Software indicators for evaluating the effectiveness of e- learning

Indicator
1. Parameters of the micro-processor;
2. The memory capacity;
3. The speed of the Internet access;
4. Presence of additional multimedia hardware components that gives an opportunity for usage of multimedia application.

Table 2.Hardware indicators for evaluating the effectiveness of e- learning

Indicator
1. The material should be presented in a logical sequence. Broken into small, incremental learning steps;
2. The material should be linked to other sources, with reading assignments clearly specified;
3. The material should be Illustrated by examples and/or case studies when new information is presented;
4. Encouragement for critical thinking, creativity, and problem-solving;
5. Relation to other material the learners may have studied or experiences they may have had;
6. Usage of illustrations, photographs, animation, and other forms of multimedia in order to present facts and reinforce concepts;
7. Abbreviations and symbols are defined;
9. Appropriate language level for the intended audience.

Table 3. Didactical indicators for evaluating the effectiveness of e- learning

Indicator
1. Opportunity for team work;
2. Opportunity for communication by e-mail;
3. Opportunity for communication by on-line conferences, discussions, chat, etc.;
4. Multilanguage support.

Table 4. Communication indicators for evaluation the effectiveness of e- learning

Indicator	Description
1. Usefulness	Depends on the concrete goals, interests, motivation and knowledge of the student;
2. User satisfaction	The information is evaluated according to the user gratification;
3. Information value	It depends on the extent of its authenticity, actuality and clearness.

Table 5. Information indicators for evaluating the effectiveness of e- learning

2.2 Defining weights of the indicators' coefficients for evaluation the effectiveness of e-learning by the expert evaluation method

One of the appropriate methods for defining the weights of the indicators coefficients is the expert evaluation method.

2.2.1 Concepts of the expert evaluation methodology

The method can be divided into three stages (Valcheva & Todorova, 2005b):

1. Framing of the questionnaire, which must consists of the following very important parts:
   - List of the indicators for evaluating the effectiveness of e-learning, which rate of importance have to be assessed by the experts;
   - A cell, where every interviewee can put his mark (the evaluation scale is preliminarily determined by the questioner)
   - Information for the competence and the resource of the argumentation of the different experts, participating in the interview.
2. Defining the circle of the experts that will be interviewed, and implementing the interview.
3. Defining the rate of competence of the experts, eliminating the inadequate opinions and processing the results. The rate of the experts' competence is defined by:

$$C = \frac{b_1 + b_2 + b_3}{36}, \tag{1}$$

where b_1, b_2, b_3 are defined according to respectively - the official position and rank of every expert; the time, spend on working at the problem; and the resource of his argumentation. The coefficient varies in the interval from 0 to 1 and the experts' opinions, which rate of competence is less than the preliminarily determined value has to be eliminated from the later processing of the results.

The meaning of b_1, b_2, b_3 can be defined in the following way (tab. 6-8):

Official position and rank	Without degree	Doctor	Doctor of science
Assistant	2	4	-
Associate professor	4	6	8
Professor	8	10	12

Table 6. Meaning of b1

	0	1	2	3	4	5	>5
Time, spend on working at the problem (in years)	0	2	4	6	8	10	12

Table 7. Meaning of b2

Resource of the argumentation	
By intuition	2
Acquaintance with the problem state	8
Practical experience	10
Implementation of theoretical analysis on the problem	12

Table 8. Meaning of b_3

The next stage of the method includes the procession of the results, obtained by the provided interview. On the basis of the received experts' assessments the weight coefficients of the suggested groups of indicators and actually the indicators themselves are processed, and the agreement rate of the experts is determined.

1. The procession of the results consists of the following stages:

4.1. Defining the weight coefficients of the suggested groups of indicators:

4.1.1. Processing the average assessment of the experts F_t for the rate of importance (weight coefficients) of each group of indicators by the formula:

$$F_t = \frac{1}{m}\sum_{j=1}^{m} h_{tj} \tag{2}$$

where h_{tj} – the assessment of the j expert for the weight of the t group, m- the number of the experts and t obtains value from 1 to 5, according to the defined number of groups.

4.1.2 Procession of the normalized assessment k_t for each of the groups:

$$k_t = \frac{F_t}{\sum_{t=1}^{5} F_t} \tag{3}$$

4.1.3 Procession of the weight coefficients of the indicators within the groups:

4.1.2.1 Defining the average assessment S_i of the groups of experts for the rate of importance of each indicator within the group:

$$S_i = \frac{1}{m}\sum_{j=1}^{m} r_{ij} \tag{4}$$

where r_{ij} – the assessment of j expert for the weight of the i indicator, m- number of the experts.

4.1.2.2 Processing the normalized assessment for the weight of each indicator:

$$S_{inorm} = \frac{S_i}{\sum_{i=1}^{n} S_i} \tag{5}$$

where n- number of the indicators.

4.1.2.3 Formation of the weight coefficients, according to the group weight, to which they belongs:

$$x_i = k_t . S_{inorm} \tag{6}$$

In that way the sum of the weights coefficients of the indicators within a given group is equal to the weight coefficient of the whole group:

$$\sum_{i=1}^{n} x_{it} = k_t \tag{7}$$

2. For determination of the agreement rate of the experts, the average quadratic diversion δi is calculated:

$$\delta_i = \sqrt{\frac{1}{m}\sum_{j=1}^{m}(a_{ij} - \overline{a_i})^2} \tag{8}$$

where

$$a_{ij} = \frac{r_{ij}}{\sum_{j=1}^{m} r_{ij}} \tag{9}$$

$$\overline{a}_i = \frac{1}{m}\sum_{j=1}^{m} a_{ij} \tag{10}$$

Based on (8) and (10) the variation coefficient V_i, is calculated, which characterized the agreement rate of the experts, participating in the research:

$$V_i = \frac{\delta_i}{\overline{a}_i} \tag{11}$$

The smaller is the value of Vi, the higher is the rate of the experts' agreement.

2.3 Processing of the results from the customer assessment of e-learning effectiveness

Normalizing the customer assessments for each indicator. For the assessment of each *I* indicator from the *j* customer the y_{ijnorm} is calculated:

$$y_{ijnorm} = \frac{y_{ij} - y_{ij\max}}{y_{ij\max} - y_{ij\min}}, \tag{12}$$

where $y_{ij\max}$ maximal assessment from the scale and $y_{ij\min}$ is the minimal.
Defining the average value of the normalized assessments:

$$\overline{y}_{inorm} = \frac{1}{m}\sum_{j=1}^{m} y_{ijnorm} \tag{13}$$

Forming the assessment in accordance with the *i* indicator by the formula:

$$A = \frac{1}{n}\sum_{i=1}^{n} x_i \overline{y}_{inorm} \tag{14}$$

where A $\in$ [0,1].

3. 3D Model as a tool for increasing the effectiveness of E-Learning

The advent of e-learning is a consequence from the increasing necessity of a learning process which is effective, flexible, adaptive to the individual student's learning style and accessible

everywhere and at any time. The interest in e-learning problems, common aspects and applications is continuously increasing (Sonwalkar, 2001; Schreurs, 2006; Schreurs & R.Moreau, 2006; Schreurs et al., 2006; Quinn Clark N, 2008).

3.1 3D model for e-learning: background and main concepts

This chapter presents a new 3D model for e-learning, in order to solve some of the problems, related to the lack of personalization, discussed in the introduction. This model is based on the following circumstances (Valcheva & Todorova & Asenov, 2010a, 2010c):

- Each student has individual learning style
- Formalism and low level of personalization in the traditional form of learning – each curriculum consists of N disciplines distributed in K educational years.
- In order to increase the effectiveness of e-learning, it should offer students the freedom to choose the most relevant learning content and also great variety of learning materials.

3.2 Description and visualization of the model

The model of the most effective way of studying, according to the different learning modalities is defined in the space of the learning process state. The space is three-dimensional and each of the axes presents the effectiveness vector, which is defined as ranged triad from:

{discipline, course version for a given discipline, the prognosticated assessment for effectiveness of the e-learning process}.

The goal of the modelling process is to define and to visualize the surface of the effective e-learning by prognosis assessment for the e-learning effectiveness.

The prognosis is realized by comparison between two vectors on the basis of scalar subtraction:

- Vector of the teaching impact and
- Vector of the student's learning style.

The Vector of the teaching impact in the model presents the quantitative assessment of the teaching characteristics of each version of the courses. The Vector of the teaching impact and the Vector of the student's learning style are chosen with one and a same dimension – (L), and each of the coordinates (p) from 1 to L presents a connected set of properties impact/modality, respectively for the Vector of the teaching impact and the Vector of the learning style. For example if property 1 of the Vector of the teaching impact presents "presenting the new knowledge by graphics", then the Vector of the learning style will be defined as an analogical modality "ability of the student to learn effectively by graphical presentation of the new knowledge".

In this way other modalities and approaches for data presentation could be defined and presented in the model such as: presentation and absorption of knowledge by text description, voice and sound, animation, problem solving, simulators, games, etc.

An unique Vector of teaching impact **VEij(1,L)** is defined for each version ***j*** of a given course ***i*** . A Vector of learning style **VSk(1,L)** is formed For each student ***k***

The prognosis assessment of the e-learning effectiveness for each version ***j*** of each course ***i*** and student ***k*** - **LDijk** is defined by the following formula (15):

$$LD_{ijk} = \sum_{p=1}^{L} \left| \; VE_{ij}(p) - VS_k(p) \; \right| \quad i \in \{1, N\}, j \in \{1, M\} \tag{15}$$

For each student ***k,*** M-scalar assessment is processed and according to (16) the course version $LD_{ij_{best}k}$ is found where the scalar assessment is minimal:

$$LD_{ij_{best}k} = \min\left(LD_{ijk}\right) \;, \quad j \in \{1, M\} \tag{16}$$

The minimal value of the scalar assessment corresponds to the minimal absolute discrepancy between the teaching impact of the concrete course version and the learning style of the k-student.

Applying criterion (16) for each course $i \in \{1, N\}$ most appropriate for the k-student's learning style course versions are formed.

In visualizing the 3D model the points, which are presented with ranged triad coordinates for the k-student are approximated with parts of planes– fig.1: {i-course, j-version, LD_{ijk} - scalar assessment according (15)}

The graphical result of the visualization presents applying the criterion (16) and the possibility to prognosticate the way of defining $LD_{ij_{best}k}$ versions for ***i*** courses. The presented result is a surface of the effective e-learning. Very clear marked local minimums present the versions of the courses, for which the k-student will have least difficulties in absorbing the learning content and the effectiveness of the learning process is expected to be maximal- fig. 1. Fig.2 shows the opposite – the course versions for the same student, which are most difficult for him, according to his learning style. The learning styles used for visualizing the model are exemplary. It is not subject of this chapter to present tools and methods for defining learning styles.

The presented results in fig. 1 and fig. 2 are for one student, 10 courses in the curriculum and from 1 to 5 versions for each course.

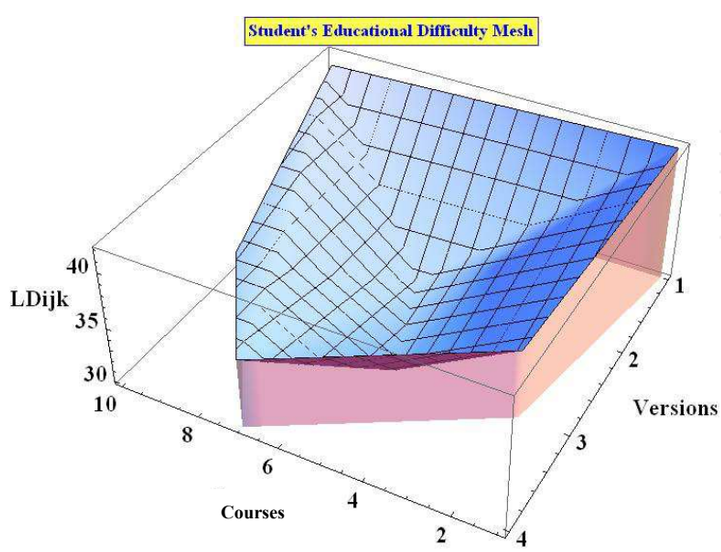


Fig. 1. Course versions, in which the student k will have less learning difficulties

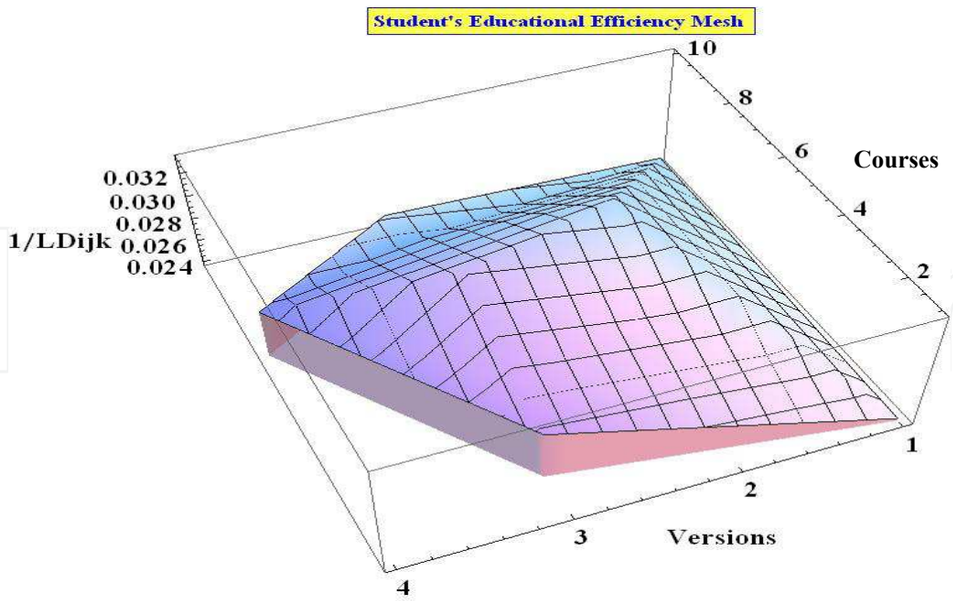


Fig. 2. Course versions, in which the student k will have most learning difficulties

3.3 One approach for applying the 3D model of e-learning

The approach (Valcheva & Todorova & Asenov, 2010b) presented on fig. 3 consists of 7 stages:

Stage 1 – the e-modules (E-module 1-n) are described by experts with metadata (E-module metadata) and are stored in database (E-learning DB). The experts are the teachers doing research in the field of e-learning.

Stage 2 – includes the student's registration and determination of his individual learning style. This is presented in the approach by the data structure SLP IDj.

Stage 3 –includes the student's request for learning (the request is presented in the approach by KSR IDi).

Stage 4 – in this stage the 3D simulator defines the best versions of the existing e-learning modules for the individual learning style of each student by applying the 3D module. The input data for the simulator are the students request KSR IDi and the student's learning profile - SLP IDj.

Stage 5 – the selected most effective e-learning module is offered to the student and the online activities are started.

Stage 6 – includes an opportunity for actualization of the student profile. It is possible to change the input data about the students learning style because of some outside factors.

Stage 7 – end of the session and saving the updated information

On fig.3 is presented a block scheme of an e-learning personalization approach with a preliminary processing and simulation of the teaching and learning processes for priori assessment of the effectiveness and for transformation of the exiting e-learning content towards the individual student's expectations. This approach is based on existing e-learning content (e-learning modules), which is assessed with a definite system of criteria for acquiring the important for the personalization content - E-modules metadata. From the point of view of the models for data presentation, it could be accepted that each course is presented by metadata structure.

The choice of the structure and the content of the metadata is based on the idea that each module can be described according the personalization needs and the presented metadata content must be understandable for the experts, which will process the courses in Stage 1 from the presented approach (fig.3).

One example for metadata structure for presenting e-learning module is shown in Table 9. The presented structure in Table 9 is an example and it aims at visualization of the formalization level by metadata. The experts' task is to assess the proportion of the learning modalities that each course offers and thus to define to which learning style it is most appropriate.

The last three elements from the metadata structure have direct connection with the learning styles and the 3D model (stage 4 from the presented approach). On stage 2 of the approach questionnaire with the students is conducted in order to be defined for student **j** his personal style of learning, presented in the approach by the data structure SLP IDj (fig.3).

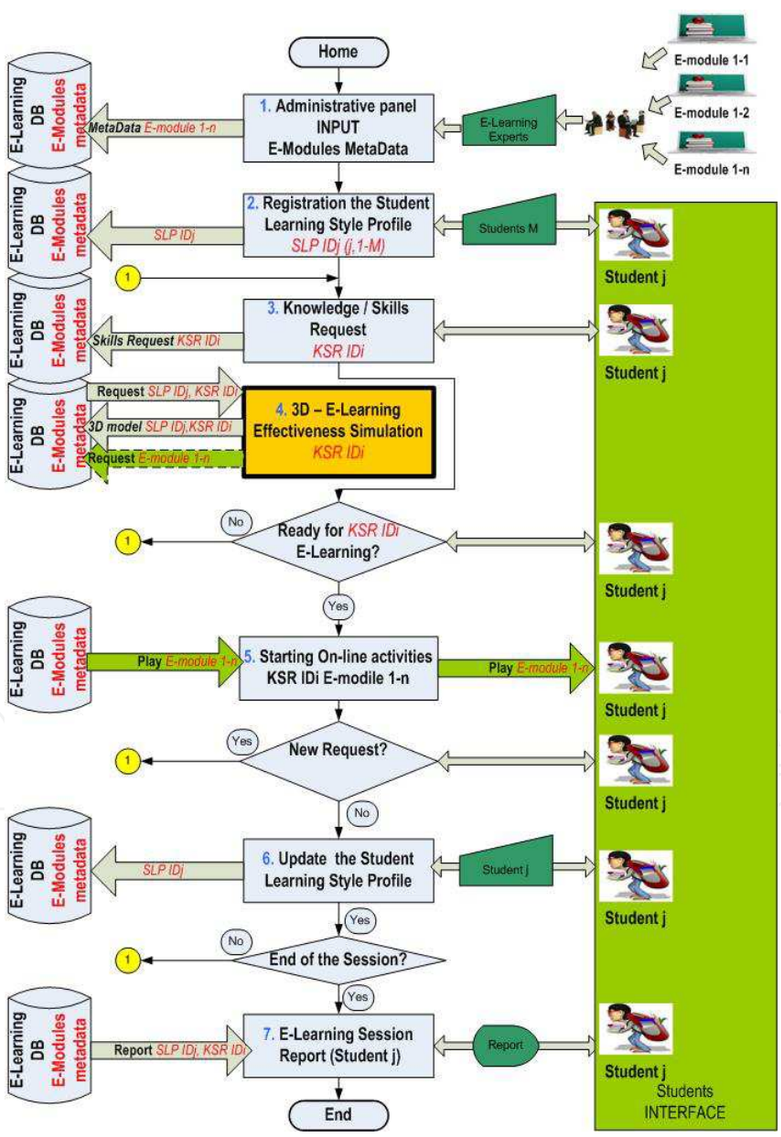


Fig. 3. Block scheme of an approach for e-learning personalization

Metadata structure	E-module 1-n1	E-module 2-n2	E-module 3-n3
Field of science	"……."	"……."	"……."
Subject	1-"…."	2-"…."	3-"…."
Date of creation	12.05.2010	17.05.2010	21.02.2010
Language (s)	EN,BG	EN	BG
Author	"……..."	"……..."	"……..."
Average duration (hours)	0,8	1,2	0,9
Learning by seeing in % from the whole learning process	70%	20%	50%
Learning by hearing in % from the whole learning process	20%	50%	20%
Learning by doing in % from the whole learning process	10%	30%	30%

Table 9. Example of Metadata structure for describing e-learning module

Table 10 shows the content of the data structure SLP ID_j, which presents the profile of student j.

Data structure for presenting students' profile for students j, j+1, j+2	Student j	Student j+1	Student j+2
Name of the student	"……"	"……."	"……"
ID	XXXX	YYYY	ZZZZ
1-st preferred language	BG	BG	EN
2-nd preferred language	EN	EN	RUS
3-rd preferred language	RUS	RUS	BG
Effectiveness of acquiring knowledge by „seeing" in %	70%	20%	50%
Effectiveness of acquiring knowledge by „hearing" in %	20%	50%	20%
Effectiveness of acquiring knowledge by „doing" in %	10%	30%	30%

Table 10. Example of metadata structure for presenting student's profile

The presented structure in Table 10 is a production of the structure for formalization of the learning content by metadata. In this way informational support of the 3D simulator for assessment of the effectiveness of e-learning (Stage 4 of the approach) is ensured, based and developed on the basis of the 3D model.

Data structure (Stage 3) KSR IDi is used for formalization of the students' request for e-learning content. For good quality of applying the experimental approach, it is necessary for the personalization of the e-learning to assess not only the personal learning style of the students, but also their individual needs for learning (Table 11).

Data structure for presenting the individual requests of student j, j+1, J+2	E-module 1-n_1	E-module 2-n_2	E-module 3-n_3
Name of the student	"……"	"……"	"……"
ID	XXXX	YYYY	ZZZZ
Field of science	"…."	"…."	"…."
Subject	1-"…."	2-"…."	3-"…."
Expected average duration (hours)	1,5	2,0	2,0
Actuality of the content – published not later than – data	01.01.2010	01.01.2010	01.01.2010

Table 11. Example of formalization of the students' request for e-learning content

The output information for applying the 3D model as a tool for e-learning effectiveness assessment is formed On the basis of the data structure from Tables 9, 10, 11. The information from Stages 1, 2, 3, according to fig. 3 is stored in database - E-Learning DB.
The 3D simulator for e-learning effectiveness assessment (Stage 4) is based and developed according the 3D model of e-learning. The input data for the simulator is the student's request KSR IDi and the profile of the student **j** - SLP IDj. In the concrete example we assess all N courses with subject „1-..", which are described with metadata in E-Learning DB – E-Module 1-1, E-Module 1-2, E-Module 1-N.
On stage 5 the most effective e-learning module according to the individual student's learning style and needs is offered and the real learning process is conducted. In finishing the learning session in the experimental approach there is an opportunity for new testing of the student – Stage 6. The actualization of the student's profile gives possibility for feedback after finishing the course.
In the experimental approach this feedback is not directed towards assessment of the e-learning content or way of presenting the material, but towards improving the student's self-assessment about his preferred learning style. In this way one of the basic disadvantages in the presented approach – the formation of the learning styles by self-assessment is not always subjective. With each module the student corrects the proportion of the three perceptual modalities in his individual profile.
The presented experimental approach for applying the 3D model for assessment of the e-learning effectiveness is important not only for presenting and applying the 3D model, but also it has methodical value, according to the idea for dynamic adjustment of the individual learning profile of each student with the aim to increase the personalization level in the e-learning process.

4. Method for defining students' motivation in E-Learning

The success or failure of any e-learning initiative can be closely correlated to learner motivation. Even the most elegantly designed training courses will fail if the students are not motivated to learn. Many students are motivated only to "pass the test.". The developers of e-learning course must strive to provoke a deeper motivation in learners to learn new skills and transfer those skills back into the work environment.
Some reasons for decrease of the students' motivation:
- Learners can feel isolated.
- Difficult navigation within course.

- Confusing instructions for tasks.
- Irrelevant material for learners' needs and learning style
- Technical breakdowns.

As a first step, the e-learning course developers should ask the prospective learners questions such as:

- What would the value be to you from this type of course?
- What do you hope to get out of this course?
- What are your interests in this topic?
- What are your most pressing problems?
- What is your learning style?

The answers to these types of questions are likely to provide insight into learner motivation, as well as desirable behavioral outcomes.

4.1 Motivation models

According to (Keller, 1983, 1984, 1987) the most popular motivation models are:

4.1.1 The Time Continuum Model

The model is presented in the form of a handbook for developing instruction and draws on approaches from linguistics, cognitive psychology, and motivation research. The model is not based on any one scientific theory or philosophy. Wlodkowski's Time Continuum Model of Motivation identifies three critical periods in the learning process where motivation is most important. Those periods are the beginning of the learning process, during the learning process, and at the end of the learning process. Each of those three periods has two distinct factors associated with it, yielding six basic questions to aid motivational planning. The factors to be considered at the beginning of the learning process are attitudes and needs. When planning the beginning of a learning experience, the designer should consider how the instruction will best meet the needs of the learners, and how a positive learner attitude can be developed. It is suggested that when possible, the instruction should focus on the physiological needs of the learners and experiences familiar or relevant to the learners. The instruction should allow for choice and self-direction in assignments. A needs assessment should be performed prior to developing the instruction to aid in appropriate planning. Stimulation and affect are to be considered during the learning experience. To maintain a stimulating learning environment, learner participation via questions, humor, varying presentation style using body language and voice inflection, and the use of different modes of instruction from lecture to group work to class discussion are strategies suggested. Wlodkowski's primary strategy is to make the learning experience as personalized and relevant to the learner as possible. Finally, competence and reinforcement are to be considered at the end of the learning experience. Frequent feedback and communicating learner progress are the author's main methods for developing confidence in the learners.

4.1.2 Keller's ARCS model for motivation and Gagne's events of instruction

John Keller synthesized existing research on psychological motivation and created the ARCS model. ARCS stand for Attention, Relevance, Confidence, and Satisfaction.

Attention The first and single most important aspect of the ARCS model is gaining and keeping the learner's attention, which coincides with the first step in Gagne's model. Keller's

strategies for attention include sensory stimuli, inquiry arousal (thought provoking questions), and variability (variance in exercises and use of media).

Relevance Attention and motivation will not be maintained, however, unless the learner believes the training is relevant. Put simply, the training program should answer the critical question, "What's in it for me?" Benefits should be clearly stated.

Confidence The confidence aspect of the ARCS model is required so that students feel that they should put a good faith effort into the program. If they think they are incapable of achieving the objectives or that it will take too much time or effort, their motivation will decrease.

Satisfaction Finally, learners must obtain some type of satisfaction or reward from the learning experience. This can be in the form of entertainment or a sense of achievement. A self-assessment game, for example, might end with an animation sequence acknowledging the player's high score. A passing grade on a post-test might be rewarded with a completion certificate.

This model is not intended to stand apart as a separate system for instructional design, but can be incorporated within Gagne's events of instruction.

Gagne's nine learning events are the most popular and effective model for creating e-learning contents. Gagne proposed that the content should have nine distinct instructional events to be effective. They are:

1. Gaining attention (reception)
2. Informing learners of the objective (expectancy)
3. Stimulating recall of prior learning (retrieval)
4. Presenting the stimulus (selective perception)
5. Providing learning guidance (semantic encoding)
6. Eliciting performance (responding)
7. Providing feedback (reinforcement)
8. Assessing performance (retrieval)
9. Enhancing retention and transfer (generalization).

4.2 Method for defining the students' motivation in E-learning, which uses the main concepts of the Keller's ARCS model and the Gagne's events

For defining the students' motivation in e-learning, we use as a base the ARCS model and the Gagne events. The reason for this choice is that these models can be easier implemented and applied according to the specific nature of the e-learning process.

After finishing given e-learning course the students could be kindly asked to fulfill a questionnaire, based on the concepts of the Keller's ARCS Model and the Gagne's events, in order their motivation to be defined. The results of this investigation will be very useful for the course developers (teachers, trainers or software developers), because they will obtain important feedback information about the students' motivation and satisfaction after finishing the course. Thus the quality of the e-learning courses can be measured and if necessary the learning content can be modified. The questionnaire will consist of the following questions, divided into 4 sections, according to the Keller's ARCS Model and the Gagne's events: The scale that could be used consist of the following possible answers:

- "Absolutely yes",
- "Yes, but not so much",
- "Absolutely no".

Attention section

The course offered me appropriate for my learning style e-materials

The interface design and navigation were easy to work with

The visual aspect of the content (i.e. rite size and color of fonts, proper line spacing,, relevant diagrams, positioned at right places) has a positive impact on the accessibility of the content

The objectives of the course are clearly stated.

Confidence section

During the course I felt myself sure I can manage with the problems

During the learning process I received feedback and support from my teachers

My success in this course is a direct result of the amount of effort I have put forth.

Relevance section

The new content was based on my previous knowledge and skills in this field

The received new information will be very important for my future work and study

The course offer me links to additional information in the field

Satisfaction section

I am satisfied with the results of my study, after finishing the course

I am feeling rewarded

I will use the newly received knowledge and skills in my work

5. Conclusion

The effectiveness of the e-learning depends on the quality and quantity of the applied e-learning materials, the needed time for taking the course and the results at the course end. As the time necessary for learning the new information that given course offers is shorter and the results at the end are better, the effectiveness of e-learning is higher.

Serious problem nowadays in e-learning is the lack of personalization of the teaching and learning process. In the Internet space can be found countless courses in one and the same theme, presented in different way, with different level of usage of multimedia elements, directed to different learning styles, with different duration and complexity. The user has the very difficult task – to find in the ocean of e-learning courses, the most appropriate for his learning style, basic knowledge and skills. This is not always possible, and even when the choice of an appropriate course is a fact, the chance the initial goal (gaining knowledge and skills in a given field) to be reached for a short time is not high. It is necessary to be created an approach, which will ensure knowledge (skills and competencies) acquiring and opportunity for preliminary selection from great number of e-learning modules with the aim for personalization of the e-learning environment according to the individuality of each student and his expectations about the final results.

The personalization in the e-learning may be described as a composition of procedures, approaches and techniques for giving the students the tools for self-learning, which will give them the opportunity to study according to their own capabilities, learning style, knowledge and skills, to choose the type of the e-learning material and the way of presentation of the new material, according to their own interests, needs and learning style.

One of the approaches for improving the personalization in the e-learning process is ensuring access to appropriate e-learning materials, according the individual learning style of the student. The learning style is the way of adoptions and procession of the information. Every person develops preferred and successive behavior and concrete approaches for studying. This is connected with three processes, which form the differences in the styles:

- **knowledge** – how the knowledge is acquired;
- **conceptualization** – how the information is processed;
- **motivation and emotions** – the way of taking decisions and emotional preferences.

One of the most important themes in psychology of learning is motivation. In order to include motivational factors in online learning, factors known as depending on the learner, assessment of the learner's motivation is required and this is the problem addressed by this research.

As a result from the presented in this chapter research some important concepts for keeping the learners motivated could be summarized in the following list:

- Defining the target audience and their learning preferences;
- Course designers must realize that learning styles are different: visual learners, kinesthetic learners, auditory learners. E-learning courses must cater for all otherwise learners will lose interest;
- Defining clear learning objectives of the course;
- Use of interactivity/Games/Simulations - using interactivity in e-learning contents has many benefits. It keeps the learners involved, breaks the monotony of a single way communication, enhances the learning experience by participation and facilitates active experimentation;
- Use of real life scenarios - Cognitive Theories say that any new information is compared to existing cognitive structures called 'schema'. Meaningful information is easier to learn and remember. It is very important for the students to know where they can apply the newly received knowledge.
- Assessment of the students' motivation.

The future work is directed to finding methods and tools for increasing the use of interactivity in the e-learning matherials. The modern computer (hardware and software) technologies offer wide range of opportunities for creation of interactive multimedia e-learning resources, appropriate for the different learning styles.

6. References

Вълчева Д., Тодорова М. (2009). Методи и средства за повишаване ефективността на електронното учене. Списание "Computer Engineering", Vol.3, №2/2009, ISSN 1313-2717, София, България.

Иванов И. (2003) Стилове на учене. Втора национална научнопрактическа конференция "Психолого-педагогическа характеристика на детството", Попово', Университетско издателство "Св. Кл. Охридски", 29-39.

Georgieva G., Todorov G., Smrikarov A., (2003) A model of a virtual university – some problems during its development, Proceedings of the International Conference on Computer Systems and Technologies CompSysTech'2003, Sofia pp IV.29-1 – IV.29-7

Hughes, J. (2008). A Framework for the Evaluation of E-Learning. Available from http://www.theknownet.com/ict_smes_seminars/papers/Hughes_Attwell.html

Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Ed.), Instructional-design theories and models: An overview of their current status. Hillsdale, NJ: Lawrence Erlbaum Associates

Keller, J. M. (1984). The use of the ARCS model of motivation in teacher training. In K. Shaw & A. J. Trott (Eds.), Aspects of Educational Technology Volume XVII: staff Development and Career Updating. London: Kogan Page

Keller, J. M. (1987). Development and Use of the ARCS Model of Motivational Design. Journal Of Instructional Development, 10(3), 2-10. John Keller's Official ARCS Model Website

Quinn N. (2008) Models for Intelligent Assistance Delivering the Dream. Available from http://www.astd.org/LC/2005/0805_quinn.htm

Schreurs J., Moreau R. (2006). EFQM and Kirkpatrick in a Framework for Evaluation of E-learning. Proceedings of the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, E-Learn 2006, Honolulu, Hawaii, USA, October 13-17, 2006. page 1780-1785. AACE, ISBN 1-880094-60-6.

Schreurs J. (2006) TQM in E-Learning: A Self-Assessment Model and Questionnaire. International Book Series "Information Science and Computing" – Methodologies and Tools of the Modern (e-) Learning, Available from http://www.foibg.com/ibs_isc/ibs-06/IBS-06-p01.pdf

Sonwalkar, N. (2001). A New Methodology for Evaluation: The Pedagogical Rating of Online Courses, Syllabus. Available from http://www.syllabus.com/article.asp?id=5914

Todorov G. (2005). Software technologies. Veliko Turnovo, Bojka.

Todorova M., Kalushkov T., Valcheva D. (2008), Influence of ICT on Learning Modalities, International Conference EDU-World. Pitesti 2008, Romania.

Todorova, M., Todorov G. (2004). Efficiency of Virtual Learning. International Conference SAER 2004.

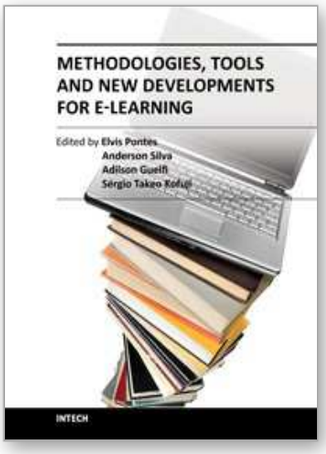
Valcheva, D., Todorova M. (2005b) Defining Weights of the Indicators' Coefficients for Evaluation the Effectiveness of E-Learning by the Expert Evaluation Method. САИ-2005, София, България.

Valcheva, D., Todorova M. (2005a) Defining a system of indicators for evaluation the effectiveness of e-learning. International Conference on Computer Systems and Technologies - CompSysTech'05, Varna, Bulgaria.

Valcheva D, Todorova M. Asenov O. (2010a). A 3D Model as a Tool for Increasing the Effectiveness of E-learning. Serdica Journal of Computing, Volume 4, N. 4, 2010 (pp.475-486).

Valcheva D., Todorova M., Asenov O. (2010b). One Approach for personalization of e-learning. International Conference on e-Learning and the Knowledge Society –e-Learning'10, Riga, Latvia.

Valcheva D., Todorova M., Asenov O. (2010c). 3D Model of E-Learning. International Conference on Computer Systems and Technologies – CompSysTech'10, Sofia, Bulgaria.



Methodologies, Tools and New Developments for E-Learning
Edited by Dr. Elvis Pontes

ISBN 978-953-51-0029-4
Hard cover, 332 pages
Publisher InTech
Published online 03, February, 2012
Published in print edition February, 2012

With the resources provided by communication technologies, E-learning has been employed in multiple universities, as well as in wide range of training centers and schools. This book presents a structured collection of chapters, dealing with the subject and stressing the importance of E-learning. It shows the evolution of E-learning, with discussion about tools, methodologies, improvements and new possibilities for long-distance learning. The book is divided into three sections and their respective chapters refer to three macro areas. The first section of the book covers methodologies and tools applied for E-learning, considering collaborative methodologies and specific environments. The second section is about E-learning assessment, highlighting studies about E-learning features and evaluations for different methodologies. The last section deals with the new developments in E-learning, emphasizing subjects like knowledge building in virtual environments, new proposals for architectures in tutoring systems, and case studies.

How to reference
In order to correctly reference this scholarly work, feel free to copy and paste the following:

Donika Valcheva and Margarita Todorova (2012). Methods and Tools for Increasing the Effectiveness of E-Learning, Methodologies, Tools and New Developments for E-Learning, Dr. Elvis Pontes (Ed.), ISBN: 978-953-51-0029-4, InTech, Available from: http://www.intechopen.com/books/methodologies-tools-and-new-developments-for-e-learning/methods-and-tools-for-increasing-the-effectiveness-of-e-learning

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