DSLEARNING – AN UNDETERMINED ENVIRONMENT FOR DATA STRUCTURE KNOWLEDGE
(DSLEARNING – недетерминированная электронная среда для знания по дисциплине «Структуры данных»)

V.Dyankova, Lecturer,
M.Yankov, Lecturer,
B. Bogdanov, Student,
Konstantin Preslavsky University of Shumen,
BULGARIA

Introduction. During the last decade the training, knowledge and mass entering information and communication technologies, are key success factors in every part the modern society’s life, connected with the using and processing of information. Together with them, the electronic, interactive training enters intensively because of its ability to use many modalities for presenting information. The implementation of practices for knowledge management (KM), gives the ability to maximize the practical effect of the knowledge – it increases the interest towards specialization, towards the mastering of new technologies and applying already know methods of practice.

The forgoing defines the knowledge management as a key element in the strategy for developing a randomly managed process. In this regard, looking at the training as such a process, there is a place for matter of application of knowledge management in an informative-educational environment. In the concept of the informatization of the sphere of education, and the entering of the new internet technologies, it is of interests the possibility of integrating the KM in the electronic training. In [11] is shown the concept of reconciliation of KM with the tasks of the electronic training for creating a practically “perfect” corporate training. Morrison [10] explains that the electronic learning and KM do the same things, but in a different way - the electronic learning also guarantees the obtaining of knowledge, but it is processed by experts with a preceding process of pedagogical design and presented in a type of a finished structure, while KM delivers a “raw” less processed knowledge. [6] Describes the absence of standards in the electronic training for presenting the nonlinearity and complexity of the processes of training and defines the essence of the modern electronic training as transfer static educational content.

In this article it is offered a practical application of the technology of KM in a system of electronic training in a limited material environment - the training in data processing. A didactical technology is developed for the study of concepts of data structures in the context of KM and based on this, the system of electronic training, DSLeaarning, is created.

The knowledge management of data structures in an undetermined electronic environment DSLeaarning.
The main stress in the electronic learning and KM – it is to help the user optimize the process of acquiring and assimilating knowledge. KM is a systematic process of compiling and using information, knowledge, experience and professional skills in order to achieve a certain goal. KM is management of the flow of information – it has to guarantee that, the needed data will reach the certain people in the right time, so that the necessary actions will be taken. In this context the KM is not a goal, but a tool.

The essence of the knowledge is of interest as to the training, as well as to the KM. [9] connects the knowledge with the training. The knowledge is defined as a possibility or potential for action or making a decision by a person, group or organization. In turn, the training is a process, which leads to changes in this state, to changes in understanding, decisions or actions. As it is claimed in [8], the KM has to begin with stressing upon creativity training, changing the one-sided perception of the world and the relations with it.

In this context the KM for the terms on data structure, has to be organized in way that allows:
- Durability of the knowledge for the terms for data structure regarding the professional orientation of the trainees, and at the same time adaptability towards it;
- Ability for formalizing the terms on data structure in the two main styles of programming: imperative and descriptive;
- A relative autonomy and independence for the knowledge on data structures specifically used programming environment;
- Integrating for the knowledge on data structures in software systems, serving material service areas;
- Organizing the knowledge on data structures in a dynamic, self-organizing system, which contradicts the independent work of the trainees;
- Emphasizing on specific characteristics on the knowledge on data structures, giving the opportunity to the trainee when encountering a term on data structures by himself, to be able to find alone its place in the system and even the initial accumulation of facts for it, to go in relation with the remaining terms, i.e. in the system.

The technology for KM suggests detailing the process of studying a term on data structures in depth by taking in to account a hierarchy of goals – the integration of goals of any level is a necessary condition for achieving the goals of the next level. The ultimate goal is achieving a balanced combination of knowledge, skills and habits, giving opportunity to the trainees for effectively executing of the following activities:
- Differentiation of terms on data structures in their logical form;
- Finding enough conditions for the modeling of a real process with adequate to its essence terms on data structures.
- Usage of available tools for realizing the software form of the data structures.

There is no formalization at the first point of organization of knowledge in DSLearning, which means that, human language is used. This is a form that follows the classical definition of a term as a system of signs, setting the quality definiteness. In this sense it is of interest looking in to the signs according to their place and role in this system. By virtue of the relations of subordination, part of the signs can be separated into significant, serving all the rest.

Defining the terms of data structures by their mutual significant signs, directs the attention of the trainees to the significant unalterable characteristics, regarding a random language for programming.

The second level of KM in the DSLearning system interprets every term for data structures as a real software object with adherent properties and specific methods of action. In [4] the trainee is looked upon as an intelligent system information system, comprised of lots of subsystems, structured in a certain hierarchies with certain functions and possibilities. The simulation of learning, as a process of solving problems, which allows the trainees to extract the new knowledge and simultaneously with this to receive feedback from the dynamic environment, for the quality of their actions.
A large part of the real existing environments in the internet, which possess a non-structured nature according to [1], are characterized with:
- There is explicit absence of the necessary for the problem solving characteristics and tools (absence of a solution with an algorithm);
- Incomplete data;
- Conflicting and illogical information;
- The usage of vague terms;

These are factors of the environment, which connect with the term ambiguity. When the factors of the learning process are characterized with the absence of sufficiently reliable sources, methods and tools, extraction, processing and storage of the necessary accurate information and knowledge, we accept, that according to [2], that the process is conducted in conditions of probabilistic ambiguity regarding factors and conditions of the learning process. In every single step of the learning process, the trainees choose amongst lots of alternatives, whose number increases additionally because of the dynamics of the environment and the complex composition of the objects in the environment. The probabilistic judgments relate only to the cognitive condition of the trainee, i.e. they measure his degree of confidence, regarding the factors and states of the learning process. A significant characteristic of the learning processes in an undetermined environment, according to [5], is that decisions are taken in conditions of probabilistic and vague ambiguity. This means that the expected effects, of the applied actions, will also have a probabilistic character. Then the choice that the trainee makes, is based on a system of previous knowledge, psychological attitudes, formed expectations, as well as interpretations of entry data, depending on the organism’s momentary condition [7].

The computer simulation allows an electronic presentation of an actual learning process in an undetermined environment. In this regard, it is of interest the usage of web tools, that simulate conditions and states of the traditional learning environment.

**System for electronic learning DSLearning.** The author’s web-based system DSLearning is available at: www.dslearning.eu (fig.1). It is made as a system of training with feedback, that uses nonlinear algorithms.

![Fig. 1](image1)

The approach of training by trainee reacting with the system is complex. Not only does the system give information, but also checks the answers given by the trainee. Depending on them, it can change the course of the lesson in one way, or another. The feedback in form of a reaction of the trainee is a basis for a constant interaction between the system and the trainee.

The system uses two modes: informational (fig. 1) and training (fig. 2).

![Fig. 2](image2)

The second visualizes every slide on a board, which resembles a real training. The elements (numbered at fig.2) in such work mode are:

1) Transition between the separate slides during the study of a specific term regarding data structures;
2) A status bar showing the term, which is being studied by the trainee at the moment;
3) Logo showing the type of the slide: informational, asking a question and reflexive. Every one of these slides has a unified type. This directs the trainee’s attention towards the expected action.

4) A main part, in which the information of a given slide is visualized.

5) Buttons, that offer secondary information about the studied term: visualization, definition, scheme and software form.

The impact on the trainee, on behalf of the system is done by input tasks. Depending on the character of the impact on behalf of the system, the trainee accepts a certain, reliable from his point of view decision. He generates this decision as an entrance via the system’s interface. It reflects the degree of the acquired material. This decision is formalized in an appropriate way and it is submitted as an entrance for the mistake analyzer. Depending on the accepted in the program’s collateral criteria, for evaluation of trainee’s knowledge, a determined responsive action is generated. It is interpreted by an appropriate information module, which is provided to the trainee in the form of a problematic situation. The feedback in the form of a reaction of the trainee is a base of constant interaction between the system and the trainee.

To provide secondary information or to register a wrong answer of trainee the system uses an additional window (Fig.3). It appears over the current slide and contains a logo with information for the trainee.

The communication between the electronic environment DSLeaning and the trainee is realized by questions, which give an opportunity for:
- A variable number of the right answers (Fig. 4A);
- A choice of a variant between the initially specified in a list of templates (Fig. 4B). Such a choice is possible for every answer;
- Option for a free replacement of parts of the problem’s solution. This provides the trainee with an environment, resembling a free writhing of a source code (Fig. 4C);

A quantity evaluation for the answers is not supported, as the aim is adopting the knowledge in the corresponding learning unit. This suggests an individual working tempo for every trainee. In this regard, it is of interest not the quantity criteria for time and minimal amount of steps, but the quality course of the process of acquiring knowledge.

The sequence of the questions for all trainees is the same (the system does not yet realize an adaptive training). The
difference is in the secondary learning units, through which is past to reach the right answer.

**Conclusion.** The usage of the DSLearning system provides visibility, dynamics and credibility of the offered learning material. With this, it is appropriate for the introduction of non-specialists and of trainees of different ages. Using the system in the training of specialists gives the opportunity for an optimal time schedule – individual work by the trainees with the system provides acquisition of knowledge and skills from the empirical and theoretical module, which exempts the auditorium work for the system "traind-trainer", given by V. Milushev, in the context of the "being traind-trainer", given by V. Milushev, in the context of the corresponding educational environment.

2. Гегов Е., Папавасилиу А., Гаврос К., Саршандинис Н., Методи за избор на решения и оценка на риска при проектиране на технологически съоръжения и комплекси, 2002г., Годишник на МГУ “Св.Иван Рилски”; том.44-45, съвещание 3.
3. Милушев В. Триадата дейности решаване, съставяне и преобразуване на математически задачи в контекста на рефлексивно-синергетичния подход, Автореферат на дисертация за присъждане на научната степен “доктор на педагогическите науки” по научна специалност 05.07.03 (методика на обучението по математика), София, 2008.
4. Николова Н. Компютърни методи за моделиране на химични структури – Дисертация, БАН, София, 2001г.

**Резюме.** Дянкова В., Яков М., Богданов Б. DSLEARNING – НЕДЕТЕРМИНИРОВАННАЯ ЭЛЕКТРОННАЯ СРЕДА ДЛЯ ЗНАНИЯ ПО ДИСЦИПЛИНЕ «СТРУКТУРЫ ДАННЫХ». В развитие, возможность применения технологии управления знаниями в информационно-образовательной и неопределенной среде рассматривается. Технология была разработана для изучения структур данных, в контексте управления знаниями, и на этой основе системы электронного образования по структурам данных, DSLearning, была создана.

**Ключевые слова:** электронное обучение, структуры данных, управление знаниями, интерактивный интерфейс.

**Abstract.** Dyankova V., Yankov M., Bogdanov B. DSLEARNING – AN UNDETERMINED ENVIRONMENT FOR DATA STRUCTURE KNOWLEDGE. In the development, the possibility of applying the technology of knowledge management in an informative-educational and undetermined environment is examined. A technology has been developed for the study of data structures, in the context of managing the knowledge, and based on this, a system for electronic education on data structures, DSLearning, has been created.

**Key words:** electronic training, data structures, knowledge management, interactive interface.