

THE NEW APPROACH ON DISTANCE LEARNING SUPPORTED BY KNOWLEDGE BASES AND SEMANTIC WEB

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ABSTRACT: *In this paper, the authors deal with the new approach on distance learning with the use of technological solutions based on knowledge bases and the semantic web. There are large number of papers, books, studies and the like, which deal with electronic and mobile learning but there are almost no papers which deal with intelligent learning. New technologies based on knowledge bases and semantic web allow completely new approaches of learning to those who for whatever reasons do not want or cannot attend seminars, lectures, courses or any other form of training. Here, for the first time beside electronic (e-Learning), mobile (m-Learning) we introduce intelligent (i-Learning) and a unique integrated concept (e-m-i-Learning). In the paper it is used Protégé platform for the update of basic knowledge as the basis of different mode of distance learning. The emphasis in the paper is not only on distance study than on any other learning that they can organize and any other business system which is not bound by time and place.*

KEYWORDS: Distance Learning, E-Learning, Knowledge Bases, E-M-I-Learning.

INTRODUCTION

Distance learning is a challenge and a tool for improving and enhancing educational processes because it provides students unlimited number of times they can listen to lectures and exercises conducted in real time, and this is one of the basis for the new and better ways of acquiring and managing knowledge. The intensive introduction of information and communication and mobile technologies in educational processes has become priority of modern higher education institutions and business systems around the world.

Modern society imposes the need to change the model of education and to approach the educational system to the actual needs and possibilities of the environment. This initiative is supported by the rapid development of new technologies, with the appearance of the Internet and knowledge bases. All this led to the appearance of contemporary and different forms of distance learning. Communication that previously took place mainly in the direction professor-student now has become much more diverse and even in that highest quality audiovisual form. Now new technologies allow us to follow lectures more efficiently and more effectively via videoconferencing. Access to learning materials, digital books and scripts, databases and knowledge bases, multimedia presentations and other educational resources, with electronic and mobile communication with professors and other students provide them a completely different experience.

Many young people find jobs immediately after graduating from high school, but this does not prevent their regular attendance. Most of them would gladly accept distance learning as their most favourable form of further education and learning. The development of new technologies has enabled temporal and spatial separation of teaching and learning and has also enabled the realization of the teaching materials with interactive elements.

E-Learning

Distance learning, learning supported by computers, web classroom and virtual classroom are just some of the terms that describe system for e-Learning. These are the systems that the organizers of distance learning enable creation, organization, control and adequate communication with the students using computers and computer networks.

E-Learning is most often defined as on-line learning which enables its users the access to educational content and constant communication with other students and professors (experts, teachers, lecturers) over computer networks, Intranet, Internet and the WWW and other digital devices.

American Society for Distance Learning (The United States Distance Learning Association) defines the concept of distance learning as “the acquisition of knowledge and skills through indirect information and instructions by using different technologies and other forms of distance learning”.

Distance learning is in the English version of Wikipedia defined as: “a learning method which does not require the student to be physically present at a specific location during the lectures“. This kind of learning opens up new opportunities for the lifelong learning of interested of all age groups. This gives them a chance to get certain diplomas or certificates from almost every online organizer of such education.

Distance learning Schertler and Bodendorf (2006) define as:”Planned learning that takes place in a different place from the lectures and requires special techniques of education planning, special teaching methods and special methods of communication through electronics and other technology, as well as special organizational and administrative solutions.”

In order to be able to effectively implement the system of e-Learning, it is necessary to have accurate and updated information for each student on his knowledge, skills, abilities, wishes, motivational factors and all other relevant characteristics. In this paper we will only indicate that there are different standards for modelling information on students (IEE PAPI Learner, IMS LIP, EduPerson, ELENA project LM and FOAF), but we will not specifically deal with them.

Besides the information on students it is necessary to have digitalized content. Under learning content we imply appropriate knowledge which is being studied, used by students and with which use the process of learning is conducted. Learning content is created by professors (experts) and is installed in the system for distance learning by administrators or specially trained operators. The content is usually presented in the text documents, power point presentations, digital books, pictures, graphs, animations, video and audio recordings and materials for different testing. The content must exist completely independently, fully described and standardized.

M- Learning

The rapid development of mobile technology and the need for new ways of education have led to significant use of mobile learning (mobile education (m-Education, m-Learning)). Mobile learning has arisen as a result of a common growth and development of mobile

technologies and electronic (e-Learning). It now provides access to educational contents necessary for learning, independent of a location, time and place.

By using great achievements in development of: *Wi-Fi, Bluetooth, wireless LAN* and global wireless technology such as *GPS, GSM, GPRS, 3G*, and satellite systems provide new opportunities for consumers. These technologies together with mobile devices have provided the possibility of occurrence of m-Learning. A very important characteristic of m-Learning is the independence of the place, the lecturer and the listener. This allowed the urban and less urban areas its very effective use and a number of its use increases daily. M-Learning provides an opportunity for the exchange of content and effective communication among users. It allows those who learn and those who teach that learning would be in real time and on-site by using new technological solutions. The users of devices for m-Learning can set and retrieve information wherever and whenever the need arises for it.

Mobile technologies have become an indispensable part of every activity, private and business processes and moments so learning is no exception in it. Mobile learning is learning by using wireless devices.

M-Learning involves learning “anytime and anywhere”. E-Learning has separated learning from classrooms and m-Learning has separated learning from a certain stationary place. It is a new concept in the process of distance learning. New technological solutions now provide wireless connectivity and exchange of information and knowledge between the media and this is why the user is no longer tied to one technology and one place. In this way they achieved significant possibilities for the realization of the concept “anytime and anywhere”.

Different authors in different ways define mobile learning (m-Learning), and some of the definitions are: “Any type of learning that occurs when a participant of education is not on the fixed, predetermined location or learning that happens when a participant uses the opportunity for learning by using mobile technologies”(O’Malley, 2003.).

“Mobile learning is learning through a set of activities and events, with a focus on a mobility of the participant in the interaction with portable technologies. (Kaleidoscope, 2003.)”

“Any service or means that enables the participant general electronic information and educational content which assists in acquisition of knowledge regardless of the location and time (Lavín, 2008.)”.

All these definitions indicate that m-Learning is:

- Any service that fits these definitions and can be a part of mobile education,
- The inclusion of supplementary services with the provision of wireless infrastructure,
- Focused on information, knowledge or content in e-Form.

Mobile learning is:

- Focused on the participant- builds knowledge and skills of participants allowing them to conclude on the basis of their own experience,
- Directed towards knowledge – upgrade of knowledge is built from a set of proven knowledge,
- Directed towards the skills of assessment,
- Directed toward community – successful participant help “the slower” participants.

Finally, the theory of mobile learning must take into account the ubiquity of personal and shared technology.

The characteristics of mobile learning:

- Enables the building of knowledge in different contexts,
- Allows participants to construct meaning,
- Mobile technologies often change the forms of learning activities and work,
- The context of mobile learning is more than just time and space.

Jones (2006) lists six reasons why mobile learning can motivate a participant: control (over goals), possession, fun, constant communication and continuity between the content.

I-Learning

In recent years semantic portals have become more popular as a support of the development of e-Learning. A great role in learning has the professor who creates the teaching content and forwards them to the students or posts them on the web site. Students are of different dispositions, education, age, come with different background knowledge and different possibilities for acquiring new knowledge. It is a problem because partly they don't know what all they don't know. Therefore, the construction of the semantic web seeks to ensure that every student according to his needs creates the teaching material and the trajectory of learning and acquires knowledge anytime, anywhere and at the speed which suits him.

Here is a new direction of development of educational portals in which the search is done through the semantics (meaning) that is added to the classic web site, rather than searching the database of keywords. For such a search it is needed the appropriate software- intelligent agent (which performs some of the tasks for the user). It is believed that the next generation of Internet will be based on the application of the semantic web and semantic portals. This new and upcoming generation of internet services can be seen as the basis of an intelligent learning (i-Learning). Semantic web and knowledge bases will be the basis of an intelligent learning. Intelligent learning in any case will not eliminate (throw out) e-Learning and m-Learning but it will be its efficient upgrade.

If the electronic learning (e-Learning) and mobile learning (m-Learning) are basis for intelligent learning (i-Learning) than we can talk about a unique and inseparable concept of e-m-i-learning as the future of distance learning. We are aware that on the new concept should invest some work in order to effectively and fully put into practice.

In order to be able to effectively implement intelligent learning we have to own intelligent systems. These are systems that can be dynamically adapted to the needs of the individuals (students, professors, experts) and must be based on artificial intelligence.

Under artificial intelligence we consider "a part of the science about computers which is engaged in designing intelligent computer systems ie. systems that possess characteristics that are associated with the behavior of people, such as the understanding of language, learning, reasoning and problem solving and similar (Radivojević, 2012)". Here we will mention a part of the areas of the artificial intelligence, those are: expert systems, machine learning, game theory, knowledge representation, search, different methods of reasoning, natural language processing and similar and because of the length of the paper we will not specially deal with them.

In 1982 Sleeman and Brown in their book called “Intelligent Tutoring Systems” introduced the term “Intelligent tutoring systems” and were different from the previous because they had the ability to adapt, change their behavior towards the individual characteristics of the student depending on their entered responses. Since the level of the development of the electronic and especially mobile learning in those years was not sufficiently developed, it is certain that then they could not talk about a unique concept of electronic, mobile and intelligent learning (e-m-i-Learning).

Knowledge Bases and Semantic Web

In order to be able to talk about the intelligent distance learning we also need knowledge bases. In this paper we use editor Protégé, an open source platform that ensures the users: update, reading and storing the knowledge. It is not our goal and we don't have enough knowledge or abilities to present all the necessary knowledge which has to have a higher education institution or a business system that implements distance learning. The knowledge base must be constantly updated with new knowledge, some knowledge is deepened and some is complemented and some is deleted especially if it is outdated and is just a burden to the base.

The concept of the semantic web is introduced by Tim Berners Lee (2001) as a clear structure to the content of the web page. It has emerged as a need for a more efficient finding of certain information and knowledge. It is based on the idea that the information on the web becomes machine readable (Christopher, 2007.). Instead of documents connected with hyperlinks it should use the interconnected data (information) which have a specified structure and meaning. To get an idea on the semantic web to function, computers should have access to collections of information. It has to ensure rules for reasoning about the data and to enable the presentation of data, information and knowledge.

Semantic web will allow computers to be able to find, understand and use the information via web in order to achieve certain goals. It covers a lot of different areas and there must be a few people that have exactly the same idea of the semantic web.

In this paper, we use Protégé platform and the semantic web for presenting part of the knowledge necessary to business systems and organizations dealing with distance education.

First we look at the infrastructure for the realization of distance learning under which we mean hardware and software whose possession provides one of the preconditions for the realization of this educational process. The infrastructure should provide: access to multimedia and all other materials for learning, the appropriate digital communication between all the students and lecturers and other persons involved in the process of learning, monitoring of the process of students and conducting other activities of importance to the success of distance learning. By using Protégé platform to introduce the basic necessary knowledge of infrastructure for the realization of distance learning and it is presented in Figure 1”The infrastructure for the realization of distance learning”.

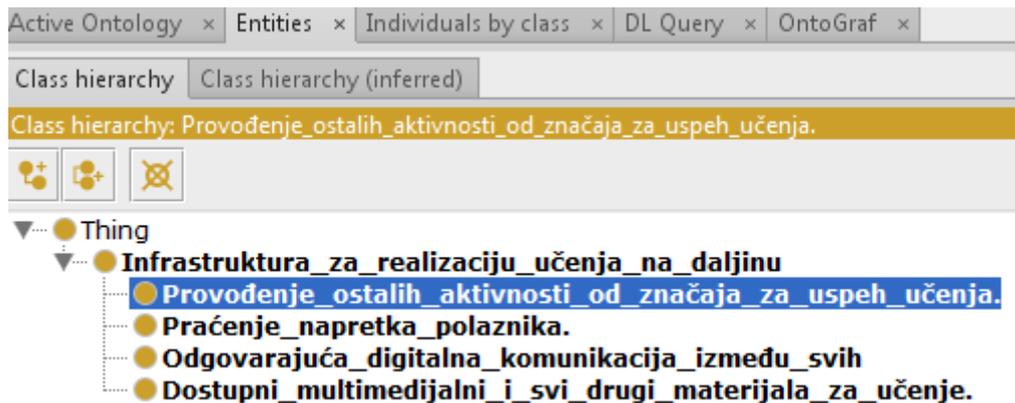


Figure 1 The infrastructure for the realization of distance learning

It is very important that the infrastructure is of high quality, modular to meet the technical standards and that it is flexible and scalable. Each institution or a higher education institution in the infrastructure for distance learning must provide the necessary resources to establish and maintain two-way communication between the teacher-student, student-administration, professor-administration and student-student. For the realization of distance educational activities (complete lessons or parts), consultations, self-test or assessment in the framework of exam-prerequisites, project, seminar papers and similar it must possess the infrastructure of the adequate quality.

The infrastructure for distance learning must be integrated into information, communication, mobile and intelligent infrastructure that conducts education and is related to the e-library and other e-Systems.

One of the properties of distance learning is modularity so every environment for distance learning can be seen as a collection of isolated modules that can operate independently and when they are employed in the conjunction with other they make up a complete environment for intelligent learning. Modularity of the environment for distance learning provides its simple modification. All the modules must be projected with sufficient details to enable them to effectively connect and replace modules with two equivalent modules. Necessary modules of environment presented in Protégé are shown in Figure 2 “Modules of environment” and include: infrastructure module, module-tools for e-Learning, module-tools for m-Learning, module – tools for i-Learning, module for administration, instructional interface module and a module for quality assurance.

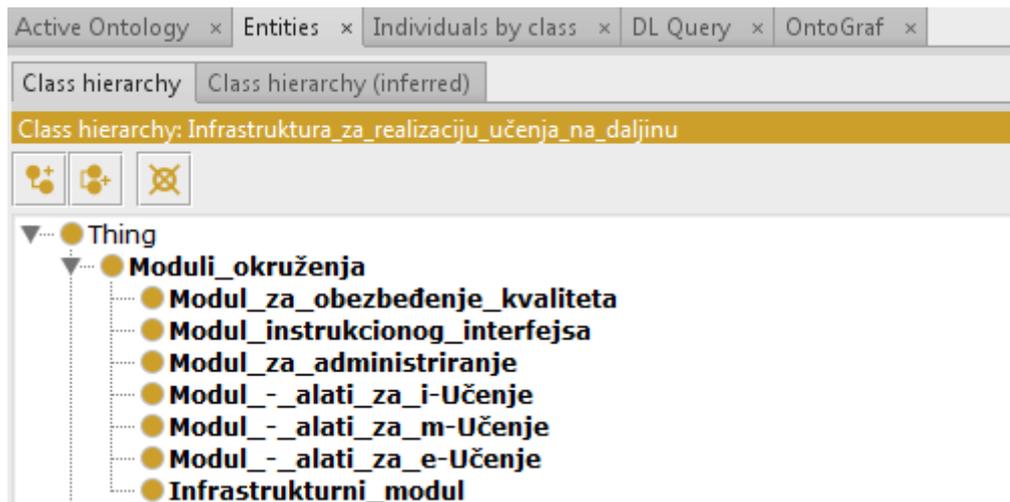


Figure 2 Modules of environment

Environment for distance learning must have:

- A unique user's interface that provides support for students, professors, administration and the access to all content,
- The ability to perform different forms of e-m-i-Teaching,
- A quality two-way communication,
- Records of the time that the student spends on studying of the materials,
- The appropriate reliability through the appropriate system of access control and content protection.

For all students who study at a distance it is necessary to provide instructions for use of the entire environment in the learning process (e-m-i-Learning- electronic, mobile and intelligent learning). In addition to the learning management system it is necessary the system for managing the contents for learning.

University professors, experts that carry out distance learning and their associates must have relevant pedagogical competences. Here we will focus more on the specifics of the online teaching and observe some of the recommendations which relate to working in the online environment. Some of the recommendations for working in the online environment provided here are taken from the collection of competencies given in "The eLearning Competency Framework for Teachers and Trainers of "the European Institute for e-Learning" (EIfEL). We have gathered the collection of the most important teaching competencies required for a more efficient implementation of the educational program for distance learning and are represented in the knowledge base.

The recommendation are divided into three key areas

- The preparation of the online teaching activities,
- The realization of online teaching activities and
- Online evaluation of students.

High-quality and appropriate online teaching first of all implies the appropriate level of interactivity. From professors (experts, lecturers) is required knowledge of the process of evaluating knowledge and skills and to design activities according to the available resources.

The competences of the teachers for the work in distance learning presented in Protégé are shown in Figure 3. “Professors’ competences”.

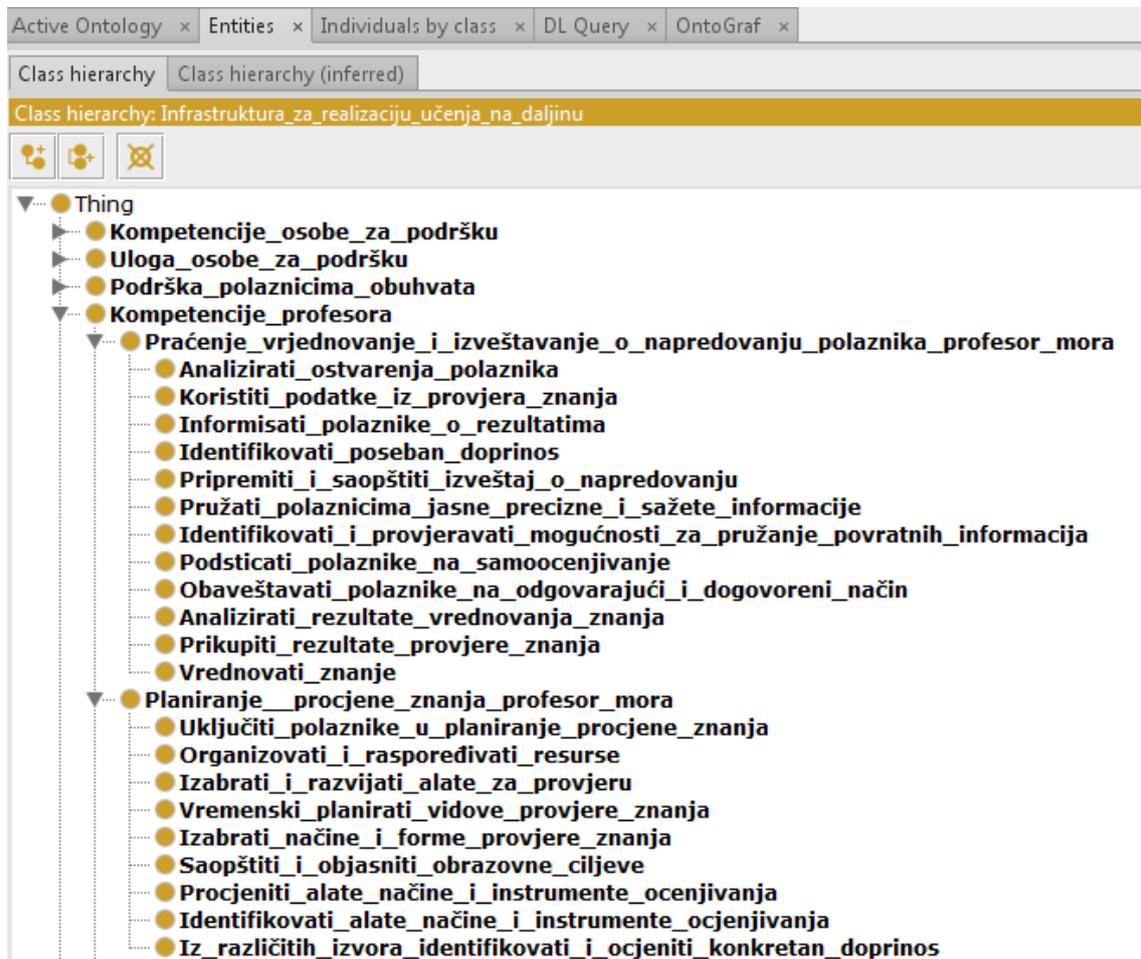


Figure 3 Professors’ competences

And these competences relate to:

1. Preparations of the students for effective use of information and communication technologies,
2. Preparations of the students for distance learning,
3. The design of the educational activities for distance learning,
4. Development of the educational activities,
5. The right choice and the implementation of the activities for distance learning,
6. Moderating activities,
7. Guiding the students through authentic and relevant activities,
8. Planning of the knowledge assessment (Planiranje procjene znanja)
9. Monitoring, evaluation and reporting about the progress of the students.

Due to the length of work we will not deal specially with all the competences but we will only in figure 4 represent competences for “Planning of the knowledge assessment”.

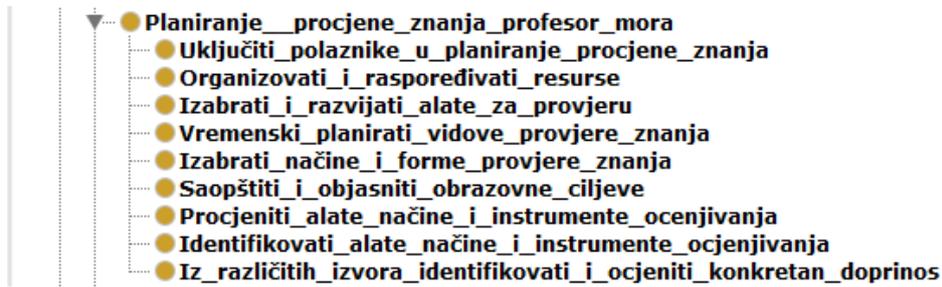


Figure 4 Competences for “Planning of the knowledge assessment”

Support for the Students of Distance Learning

The students must be in detail and clearly informed about the conditions and specific requirements of distance learning and especially about the material and technical requirements (computer, internet access) which they need to provide for themselves in order to be educated at a distance.

In order to organize successful distance learning it is not sufficient just to provide students with the learning material and to leave them to manage on their own. It is very important to provide them with all the information that will help them in learning, to give them the necessary instructions related to the material that they use in learning, show them the additional resources necessary for a more efficient learning about the matter, to help them with adequate advice to persist in the learning process, motivate them to maintain pace in learning, to exchange information with colleagues and similar.

Experience shows that the process of distance learning one part of the students leave or finish unsuccessfully and for the reasons stated: the loneliness of the participants, the lack of social integration, insufficient information and technical problems.

Therefore, for the students of distance learning must be provided a certain form of additional support through various functions and processes. The support to the students should enable their easier learning and to build up their own understanding of the learning material. The support to students must provide resources, strategies and methods which represent the physical, social, emotional and intellectual support needed for effective learning. In this way it could be a preventive work in order to reduce the dropout rate from learning, increasing the overall quality of the educational process.

Support to the students is not a task for just one man it must be realized by a whole team led by the coordinator. The realization of the support to the students is considered one of the most important factors of quality of distance learning. It must be engineered at the outset, in the course of defining the concept of a global program for distance learning.

The support is implemented through a number of different actions and in the paper is given only the foundation represented in the knowledge base. Some of them are: Analysis of the needs of the students in terms of assistance, defining the field of support in learning, the identification of roles and functions, the scope of intervention, the choice of tools for communication and the creation of tools for monitoring the support process.

The role of the person for support (mentors, tutors, guides, coaches, moderators, leaders) is very important for distance learning because it needs to work with groups of students but also with the individuals with the aim to facilitate the mastering of necessary material and to successfully complete the provided training (course, seminar).

The role of the person for support is to: motivate the students, ensure the availability of communication tools, dedicate a certain part of time to every student, ensure the interaction with all participants in the educational system, ensure the attractiveness of learning, organize the monitoring of students' achievements and similar. Some knowledge is entered in the knowledge base with which the person for support must dispose of Figure 5 "The role of the person for support".

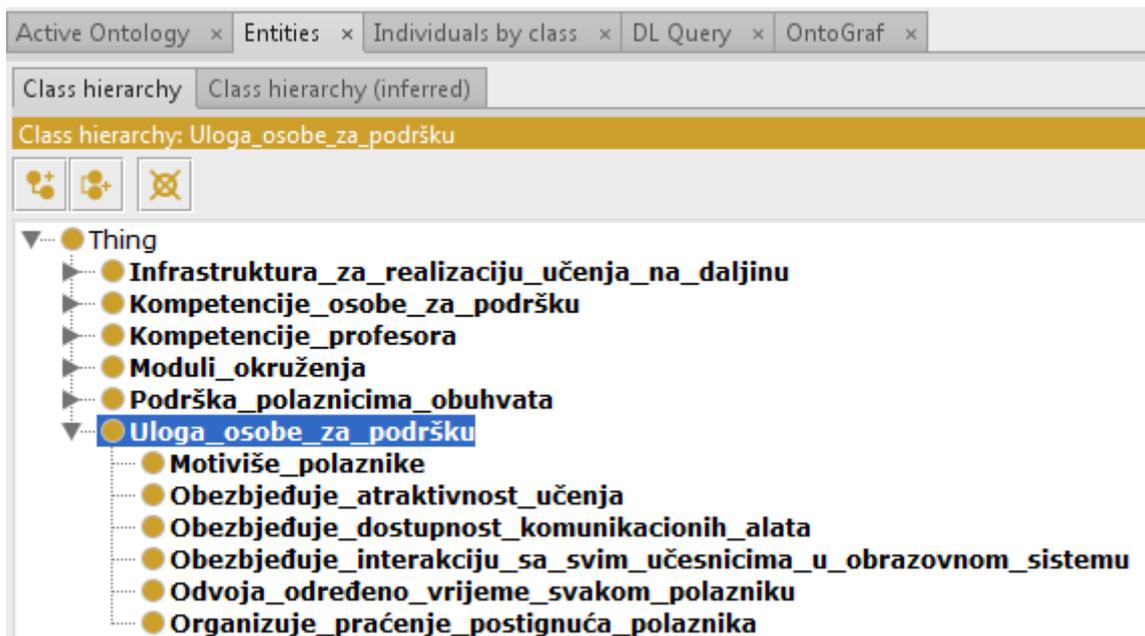


Figure 5 The role of the person for support

In figure 6 are presented by Protégé platform competences of the person for support, and some of them are: the ability to transfer knowledge, the ability to create individual training program, to know the process of learning, to know new technologies, that has a good communication skills and similar.

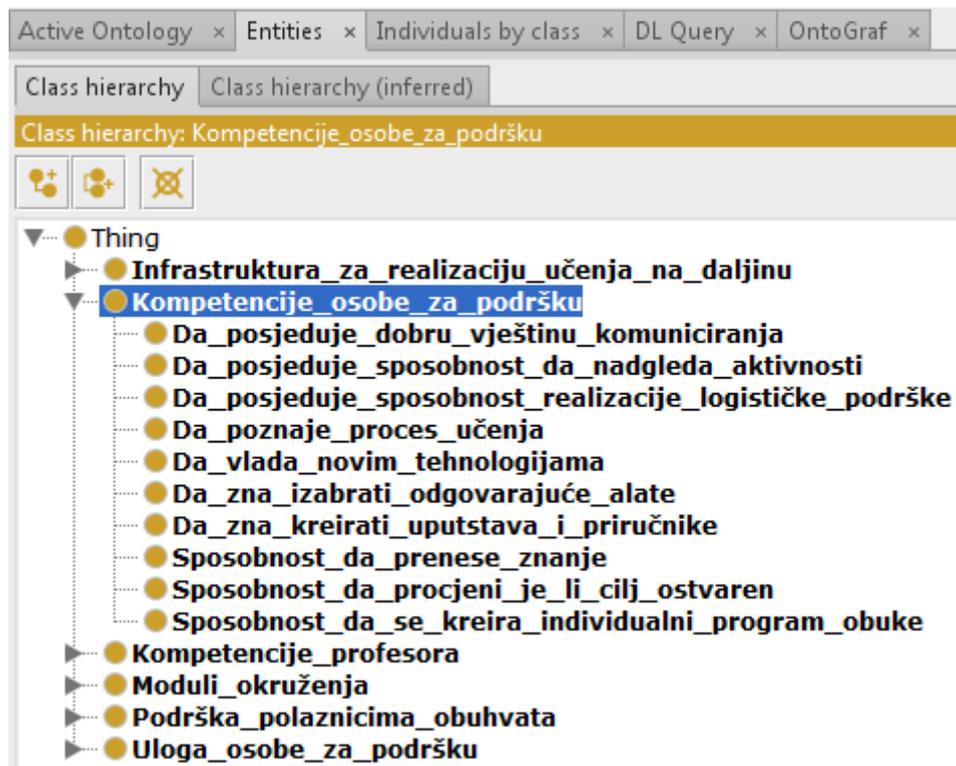


Figure 6 Competences of the person for support

All the attempts to develop a system of distance learning, as different from each other have led to the common characteristics of what it should be and what should be provided. By studying these characteristics we have come to the following characteristics of distance learning:

- The students take responsibility for their learning,
- Place of learning can be chosen,
- Learning is mostly alone or in small groups,
- The students chose their own way of learning – actively or passively,
- Students chose the level of interaction,
- Students learn by the available time and in their own pace,
- They conduct their learning with the help of new technology,
- Students find and attend the programs they are interested in,
- Students can participate in the highest quality or most prestigious programs,
- There is a physical separation of professors(experts) and students,
- New technologies are used for connecting,
- Two-way communication between all participants,
- The control of learning conducts the student,
- Students can achieve direct communication,
- It is provided a complete focus on the student,
- The students decide themselves about the direction, scope and the duration of learning,
- Professors(experts) define the objectives and facilitate the learning process,
- It is ensured the exchange of knowledge,

- It is ensured multiple sensuality and similar.

Technological Trends

A large number of business systems that produce and distribute software and hardware as well as the consulting firms often uncritically promote e-Learning, m-Learning and i-Learning. It should be open for innovation, but also need to be critical and to question assumptions. Critical attitudes do not mean opposition to e-Learning. It is certain that e-Learning has great advantages when used appropriately.

It should first of all think about those educational technologies that have proved successful and those that were less successful. All technological innovations must pass a certain period of application in practice and the practice will show which are successful.

In Figure 7 “The curve of development of e-learning technologies” shows the dynamics of innovations in e-Learning.

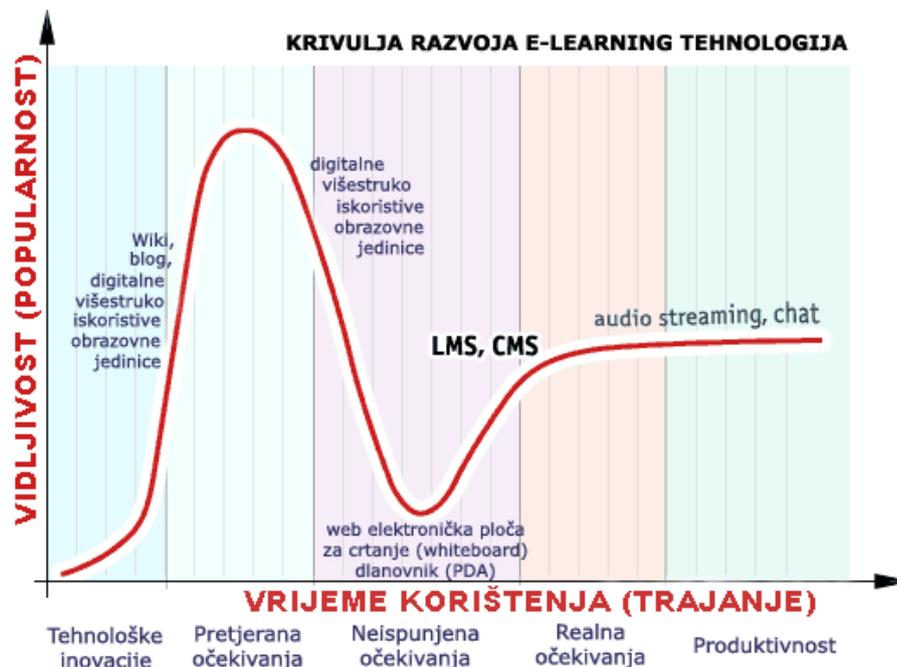


Figure 7The curve of development of e-learning technologies

(Taken and adapted Zemsky and Massy (2006))¹

In the figure you can see how technologies go through different stages of popularity, acceptance and use. A good part of new technologies quickly reaches its peak in popularity because they are forced to it by major business systems and technological leaders. The reality is much different because it soon becomes clear that the technology is not a medicine for all and that the initial enthusiasm is waning fast. As we get to know some of the technologies and recognize its advantages (if any), its use, market presence and acceptance in use is re-growing.

¹ Zemsky, R. i Massy, W. F. Ometena inovacija: Što se dogodilo e-learningu i zašto, *Edupoint*, 47(V). (2006.).

Educational and other institutions that use and want to use the system of distance learning, in addition to the large investment in the software they must put a lot of effort to ensure technical support and training for their use because such systems to the large number of users may seem very complex and complicated.

CONSLUSION

In this paper, the authors presented a different approach to distance learning with the use of new technological solutions based on the knowledge bases and the semantic web. In addition to electronic (e-Learning) and mobile (m-Learning) they introduced a new concept of intelligent (i-Learning) and they suggested a unique integrated concept (e-m-i-Learning). In the paper is used Protégé platform for updating basic skills as the basis of a different mode of distance learning.

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