The Model of Continuous Profession-oriented Learning in the E-environment Based on a Competence Approach and Academic Knowledge Management

Abstract: The paper presents a model of continuous profession-oriented learning in the electronic environment at organizational, technological and learning levels.

The learning level involves the application of modern technologies in e-pedagogies. The educational process is being built on the bases of iterative analysis, competence assessment and individual trajectories of learning.

The organizational level implies the formation of integrated knowledge space which unites community of teachers from various higher educational institutions, research organizations and business enterprises within the system of academic knowledge management.

At the technological level the members and partners of the integrated knowledge space are provided with appropriate instruments within the framework of social networks to develop educational and methodological materials, to search, to capture, to accumulate and to systematize knowledge with respect to the competence model’s requirements based on ontology method.

The model aims at developing the methodology for creating and maintaining the intelligence systems to generate comprehensive competences. It enables the education institutions to effectively solve the problem of enhancing the education quality and assurance to meet the requirements of the business innovative development in knowledge society.

Keywords: E-learning, Lifelong education, Continuous Professional Education, Competence Approach, E-information Educational Environment, Information Knowledge Space, Information Centre of Disciplines, Distributed Chair, Knowledge Management, Ontology.

Introduction

The education system nowadays faces the challenge of globalization of economy, the transition to knowledge society, rapid obsolescence and unprecedented renewal of knowledge. Hence it sets up new goals: to facilitate the learners to develop relevant skills of self-learning, of searching and analyzing the adequate information, of being innovative and socially adapted to the knowledge economy. The speed in the change of knowledge technologies, organization structures constantly accelerates and requires the profession-oriented learning to be continuously developed on the basis of a competence approach.
The ever increasing changes of knowledge, technologies and organizational structures necessitate the continuous profession-oriented learning based on competence approach. The coordinators of the European pilot project «TUNING Educational Structures in Europe » J. Gonzales and K. Wagenaar point out the necessity to reach transparent professional portfolio, to concentrate on learning outcomes, to shift to student-oriented approach in education, to meet the growing demand for lifelong learning, to raise the level of employability and citizenship, to broaden European dimension in higher education (Gonzales, Wagenaar, 2005).

The introduction of profession-oriented skills into the educational curricula is a key element of the Bologna reforms. The Bologna seminar on enhancing graduate employability held in Swansea discussed the problems of the integration and mobility, the alliance of higher education institutions with business, the inclusion of profession-oriented competences into education programs. The seminar recommended the universities to help the students to design their learning trajectory to get the appropriate competences for successful employability, to identify the skills which are embedded within the framework of the educational program and other kinds of activity in the three-cycle system as well as the Dublin descriptors of qualification. The higher education institutions are to develop a wide range of ties with industries, small and medium business, charity organizations, public sector through consultative councils, exchange and training programs, for the students to know the employer’s requirements (Bologna Seminar on Enhancing Graduate Employability, 2006).

In the current economic climate the potential of lifelong learning is of high importance. Lifelong learning offers some ways of rethinking the approaches to higher education, the ways to develop relationship with business, employers, citizens and society.

J. Smith and A. Spurling have given a definition of lifelong learning: that it relates to people learning consistently throughout their lifespan, it may start at any age (Smith and Spurling, 1999).

The models of lifelong learning were presented by J. Simmons (Simmons, 2009). One of the models contemplates the employee’s insight of lifelong learning to improve their current and future prospects in the labor market; the other reflects the interests of the employers to improve the organizations performance and effectiveness. The employee’s model reflects the funding, the motivations of learners and the expected outcomes. The employer’s model shows external factors, employer’s motivation and also the expected outcomes.

Lifelong learning makes the higher education institutions to redesign their organization of learning in line with offering a wide cohort of learners the realization of their potential. One of the crucial elements of lifelong learning is “to broaden access to higher education and to promote equity by enabling populations that, for various reasons, were excluded from mainstems universities to achieve academic or professional qualification” (Guri-Rosenblit, 2009, p.5). The problem of the access to higher education were discussed in Bologna document “Trends V: Universities Shaping the European Higher Educational Area” (2007). The document was aimed at finding out how a new trend was being realized in higher education institutions. Trends V concentrate on the use of such instruments as qualifications frameworks in the context of lifelong learning (Crosier D., Purser L., Smidt H., 2007).
Thus, the realization of continuous professional education depends on the structures of new style, i.e. instruments developed to improve the qualification transparency and flexibility of learning trajectory. They are based on the Bologna instruments for creating the European Higher Education Area.

1. Continuous professional education based on competence approach

The fundamentals of professional education based on competence approach were contemplated in the project TUNING (Tuning Educational Structures in Europe, 2003 – 2008). This project started in 2000 as a project to link the political objectives of the Bologna Process and the Lisbon Strategy to the higher educational sector.

The project TUNING acknowledges that universities should not look for uniformity in their degree programmes but look for points of reference, convergence and common understanding. It does not seek to restrict the independence of universities and protects national and local authority.

The project focuses on educational structures with emphasis on the subject area level, the content of studies. The main aim and objective of the project is to achieve the comparability and compatibility of curricula in terms of structures, programmes and actual teaching.

The Tuning project has developed a methodology which can serve as a common basis for elaborating European framework of qualifications and competences.

The important objectives in the project are:

- to provide the convergence of higher educational systems in generic subject areas;
- to develop professional and academic profiles to achieve learning outcomes;
- to develop generic and subject specific competences;
- to provide transparency to educational structures and inclusion of innovations via best practices and exchange of experience;
- to establish European networks to get the information about best practices, motivation to innovative processes and quality in the exchange of information;
- to provide collection and exchange of information on the development of curricula in the relevant subject areas;
- to form the relationship between the participants of the project to get a common platform in the subject areas;
- to develop methodology to analyze the generic and specific elements and domains and to tune them;
- to ensure compatible actions of all the participants and stakeholders in tuning the educational process.

The designing of study programmes which meet the requirements of European and national qualification frameworks, Dublin descriptors, lifelong learning implies a wide application and development of a competence approach. The later as the methodology for designing educational programmes of new generation ensures the effective quality management of professional education to match the demands of
labor market. This approach implies that the educational process must aim at developing competences to meet the requirements of contemporary workplace.

The competence approach becomes dominant in education and reflects the requirements not only to the content (which knowledge, skills and abilities the specialist should have in his/her professional domain) but to the behavior components (capabilities to use knowledge and skills in decision making). At present a competence is considered to be a strive and readiness to successfully use of knowledge, skills and personal characteristics in the professional activity. The model of competencies in a professional domain reveals a specialist’s character in a full and concrete way as compared to a set of qualification characteristics. That is why the study programmes for different levels (vocational, high, higher, postgraduate education, different courses, training and etc.) are of competence character.

A comprehensive assistance in designing professional competences, especially in the part of alternative basic study programmes can be made by national qualification frameworks and the professional standards which are being developed in various industries to reflect generic and professional competences.

The flexible and dynamic study programmes in line with the principles of continuous professional education necessitates the instrumental support by providing methodological materials at related levels, integrating various study units in repositories and involving different communities of practices within the universities networks. Among the network structures we may highlight Open Course Ware, Open Educational Resource Commons and others. Competences can be obtained and developed at different levels of education. That is why it is necessary to shape the integrated knowledge area with the related system of knowledge in the context of the ontology at information-technological level (Gruber, 1993), the implementation of new methods of organizing and assessing the educational process at a pedagogical level (Mizoguchi, 2000), the application of e-learning and Web 2.0, the implementation of new principles to create an educational content in the collaborative environment of the academic staff (Hayes P. et al, 2005).

The paper suggests the model of continuous profession-oriented learning realized in the e-information educational environment at the organizational, technological and pedagogical levels. This model is based on the systemic approach (Leibold, Probst, Gibbert, 2006), ontological engineering (Mizoguchi, 2000; Brewster C. et al, 2004), multiagent systems (Shoham & Leyton-Brown, 2009).

2. The pedagogical level of continuous professional education

The modern pedagogy implies the building of individual trajectories of education coming out from the level of educational program, a set of generic and subject specific competences, individual capabilities and personal demands.

The organization of the learning process based on the integrated information knowledge space helps to realize the following principles of e-learning:

- Individualization of the learning process. The study program are designed for a learner in compliance with the qualification requirements and individual capabilities.
• Free access to the world information resources through global networks. A learner receives a possibility to address to the courses developed by different authors, to get a consultation from different higher educational institutions via the integrated educational networks.

• Creativity of education. The learning process is being realized through trainings, exercises and case studies when creative rethinking, processing of the knowledge and involving into research activity takes place.

• Practice-oriented learning. A learner while applying the accumulated knowledge in his/her practice receives the information which can be used in designing a proper set of study courses in a more adequate way.

• Collective and collaborative assimilation of knowledge. Knowledge is being assimilated in the situation when the teachers and learners direct their endeavors to reach the adequate learning outcomes especially in developing some projects.

• Continuous renewal of knowledge. Each learner should develop his/her skills of self learning. That’s why the knowledge management becomes crucial for capturing knowledge from various sources.

The learning process is being realized on the basis of iterative analysis, competence assessment and individual trajectories of learning. Various learning technologies should be applied in respect to specific capabilities of an individual learner, his/her technical devices and personal preferences for acquiring knowledge, audio-, video- or other devices. A learner is provided with an individual learning scenario that is a study guide to self learning.

The e-learning rests upon a distributed virtual education space where a learner should be a self-oriented person who is to achieve the desired educational goals. In the new environment the objective of the learning process is to integrate the efforts of the teachers mostly being as consultants and the endeavors of learners to realize the study program and reach learning goals.

Thus, electronic education in the integrated information and knowledge space helps to rationally harmonize various study program with technologies and different forms of learning to enhance effectiveness of the educational process.

3. The organizational level of the e-information educational environment

The organizational level implies the creation of integrated information knowledge space that unites a community of teachers, higher education institutions, business people and employers (Tikhomirova et al, 2010).

The universities networks suggest the formation of communities of practice and some electronic universities facilitate in establishing distributed (virtual) chairs. The distributed chairs are flexible and adaptive in organizing the learning process in compliance with the demand of the educational services market and individual requirements of the concrete learners. The quality of the organization of the learning process is being improved due to collaborative participation of the chair’s members in developing and updating the learning and methodological materials, in discussing the results of the introduction of new technologies into the learning process.

The distributed chair concentrates its attention on operative and flexible support of the methodological materials, on the permanent development of study programmes with the reflection of
world tendencies in theories and business practice. The learning materials are being made updated within the framework of e-learning.

The virtual environment for collaborative activities of participants in the scientific and educational process and the competence approach to learning necessitates the formation and wide use of the Integrated Knowledge Space (Tikhomirova et al, 2010). The Integrated Knowledge Space (IKS) incorporates the knowledge of scientific schools generated in grants, dissertations, innovative projects within the competence centers and laboratories. As well, it embraces educational and methodological materials for educational courses. IKS provides the integration, accumulation and support of the content of adjacent, contiguous disciplines within the framework of the knowledge management system. It facilitates the access to research and educational materials. This enables:

- the union of various sources of information on different disciplines, specialties and educational process participants (teachers, scholars, representatives of business, postgraduate students, students) within the integrated system;
- a continuous development of the system due to the renewal of academic theoretical knowledge and new experience obtained by the faculty and students in the course of the educational process;
- access of relevant information to each participant of the scientific educational process in harmony with his/her knowledge, needs and preferences;
- a distributed access of the participants to the content in a virtual environment.

The constituent unit of the IKS is the Information Center of Disciplines (ICD). As a component of IKS the purpose of this centre is to be an information resource for making the interconnections of faculty, designers of learning and methodological content within a framework of separate disciplines. ICD facilitates a continuous process of collaborative, joint professional designing, developing and usage of educational materials for all disciplines embedded in the curricula by interested participants. It includes and maintains a wide set of learning and methodological materials, integrated references to the research publications of scholars, teachers, postgraduate students and students as well as to open educational resources.

ICD goals are as follows:

- creation and accumulation of research, learning and methodological materials for all disciplines;
- development of educational and methodological content at an adequate professional level;
- provision of ongoing work to update the materials and content;
- joint collaborative work of the distributed chairs of the university to develop the discipline and share knowledge.

ICD can be considered as a centre for integrating experience and intellectual capital of teachers, assistants, and professors within the framework of the Integrated Knowledge Space.

The objectives of ICD are summarized as follows:

- to create and update the materials in ICD by involving the teachers of the distributed chairs or the teachers from the educational consortium;
• to use the R&D findings in developing the content;
• to attract the organizations and business people as the developers of the content;
• to use the findings of the postgraduate students research in developing the content;
• to organize educational and research work among the students;
• to organize special service units.

The ICD helps the teachers to store and accumulate the learning and methodological materials, to share ideas and information with colleagues, to cooperate with each other by using technological instruments.

In comparison to traditional e-learning the ICD and the IKS can be referred to as a new generation of the systems of innovative learning.

Innovative e-learning within the framework of the ICD has the following specific features:
• learning process is being integrated into the organizational and social processes of knowledge transformation within the framework of the networking interconnection of educational, scientific and business entities;
• new knowledge is being generated within the real-time regime, which allows the participants to switch from periodically updating content to updating content when it is required;
• several professional communities, communities of practice and partnerships are being created – “student-tutor”, “student-student”, “tutor-tutor”, “department-enterprise”, “department-scientific organization”;
• the quality of learning based on research and innovations becomes a leading factor in learning development;
• the scientific-methodological development of each discipline allows tutors to speed up their scientific research;
• some new technological, pedagogical and organizational innovations are being created during the scientific and educational process.

4. Technological level of the electronic information educational environment

The quality of learning process can be enhanced by integrating and coordinating the endeavours of related chairs and departments in the development of learning courses with the implementation of knowledge management methodology including object approach with ontological definition of conceptual model of knowledge used.

In the object way of knowledge presentation each learning object stands as a complete semantic knowledge item. Specific learning sequences can be built by the separate objects according to the learners’ capabilities and field needs. As a result, the shift occurs from the big and solid courses to the plenty of Reusable Learning Objects (RLO) available for search and inclusion into the learning sequences. The IMS Global Learning Consortium contributed a lot into the development of the object methodology of learning courses.

The development of an object can be carried out by various authors in different environments. All knowledge objects are located in the special storages – repositories. The objects can be retrieved from the repository and used by a student during the learning process.
The integration of knowledge in IKS and designing learning courses and learning objects implies the common concepts of knowledge based on ontology (Hayes P. at al., 2005; Mizoguchi R., Bourdeau J., 2000). The successful process in the integrated knowledge space depends upon the ontology specification at domain and learning levels and learning object repository (Y.Telnov, 2004).

**The domain ontology.** The ontology specification entails the domain ontology that describes the learning activities independently on types of students and forms of education.

Each learning activity can be presented as a basis for separate integrated learning course related to the other courses within the landscape of knowledge. The specification of learning courses is convenient for structuring an educational plan. A student can switch to different related activities while taking learning courses.

Each activity can be studied in a generic or specific mode. Generic learning is provided to all categories of learners and by its nature presents fundamental education. Specific learning presupposes advanced level of studying the subject taking into account the following parameters: specialty of learner, chosen learning subject (concrete sub-activities and processes), and qualification level that allows to solve problems the learner faces at the workplace. The “depth” of learning material depends upon the number of levels of activity’s decomposition into the processes, sub-processes and actions, while the “width” of material is determined by the number of subtypes of activities specified by various classification features.

**Learning Ontology** defines the content of educational processes within forms, types and technologies of learning, as well as specialties, disciplines, subjects, roles of students and teachers, etc. Learning ontology in its paradigmatic aspect defines the forms of education and the classification of learner's categories (higher education based on the bachelor-master system; postgraduate school; doctorate; vocational training). Taxonomy formalizes the obligatory requirements of educational standards to the organization of learning processes and doesn’t depend on the learning strategy.

The diverse trends of training and specialties are reflected in the learning ontology and define specific requirements for the learning process organization. Specialties determine a set of competences related to subject activities. Consequently the rules of choosing learning objects and their embedding into the learning scenarios according to the qualification features of learner's category are formalized in the learning ontology.

**Learning objects in repository.** In the simplest way, each learning object relates to the single term of the ontology’s problem field. In this case the knowledge space is well structured and unique indexes are specified (the term key feature defines a single learning object). However this doesn’t exclude the ability to prescribe several items of one type of the learning object to each term which differs by a presentation form (e.g. text, mathematical formalized description, multimedia, hyperlink to author’s e-mail, tests, case-studies, examples, exercises, etc.). A learner can get several versions of the learning object produced by various authors where one version is the main and the rest are additional.

E-learning technology based on the ontology and learning object repository includes the following technological procedures (figure 1):

- formation and renovation of a learner model;
- development of a learning scenario within the learner model;
organization of educational process in line with the learning scenario.

Figure 1. E-learning technology based on the ontology and learning object repository
Formation of the learner model. In order to create a scenario for an integrated course a learner model has to be specified. This model is defined by the category of a learner. The objective characteristics of the learner can be obtained from his/her registration form and educational history, i.e. specialty, general level of knowledge and test results in the concrete courses. The preference characteristics of the learner include specification of his/her professional work, qualification, type of acquired education, and some classification attributes, such as study subject, goals of learning, role in the activity.

Learning scenario development. The process of learning scenario development includes the following steps:

1. To choose learning course (the activity) and to check its compliance with the learner model (specialty, learning goal, qualification level). In case it fits the learner model then move to step 2 otherwise quit the procedure with recommendation to choose another learning course (the activity) or special training program to fill the gap (in order to get advanced knowledge in related courses).
2. To describe the attributes of the activity’s semantic template.
3. To find and provide the necessity of “deepening” the learning course. If deeper study is required then move to step 4 otherwise – step 5.
4. To decompose the activity into processes and to provide the list of processes within the framework of the learner model.
5. To check and provide the necessity of “widening” the learning courses. In this case move to step 6 otherwise quit the procedure.
6. To decompose the activity into subtypes and to provide the list of subtypes of activities within the learner model. Move to the step 1.

Organization of educational process in line with the learning scenario. This learning scenario can test the understanding of the crucial knowledge in the chosen domain and may refer to the next level of education or repeat the material if necessary. Thus specific learning sequences are provided. In case of successful testing the system forms the list of concrete subtypes of processes for further study.

Conclusion

The offered model of continuous profession-oriented learning in e-information educational environment based on competence approach enables to specify the requirements to the creation of the information knowledge space at the organizational, technological and pedagogical levels. The implementation of the model into the learning process provides effective outcomes in organizing the education of specialists with work-related skills, in improving the quality of curricula, educational and methodological materials to meet the requirements of the innovative development of business enterprises and organizations.

This model facilitates the development educational program for different students and learners in line with their learning trajectories to meet the requirements of labor market in a globalize world and emerging knowledge economy. The model concentrates on the competence approach which allows the learners to obtain and develop their capabilities, transferable skills and related competences to be prepared well for their future role in business and society.
References:


