Methodological Problems in Organization of Educational Process for Remote Audience

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Abstract: A specific feature of modern science and technology development is conditionality of economic wellbeing of any country, first of all, by the educational level of its population. At present, the trend to educational sphere informatization becomes ever more appreciable. Electronic textbooks and automated training systems are developed, virtual universities are organized and the problems of distance learning are discussed. However along with training process computerization, the imbalance between the technical means for storing and transmitting information in telecommunication networks, on the one hand and requirements to information content in the network servers and information structuring and selective access, on the other hand, becomes ever more noticeable. This article is devoted to the problems of didactic, methodological and pedagogic provision for the information and education environment of a higher educational institution working with remote audience.

Key words: Information · Pedagogic provision · A higher educational institution · Remote audience

INTRODUCTION

During the economic crisis in the years 2008–2009 and post-recession periods, when budgets for personnel development substantially decreased in the majority of countries, a stable trend and a growing interest of business structures to distance learning (DL) appeared [1].

New technologies and concepts determine main trends of current use of e-learning in personnel management (Fig. 1):

Although not all these trends are new, the already known trends change in a sense that companies reveal the potential of already known solutions deeper and tend to expand application of their systems instead of replacing them with others. Accepting these trends as topical is the first step to obtaining the maximal effect from them [2].

A global trend is transition from extra-mural education to distance learning and the number of educational institutions with open an distant learning grows [3, 4]. However as the training process becomes more and more computerized, the ever more noticeable is
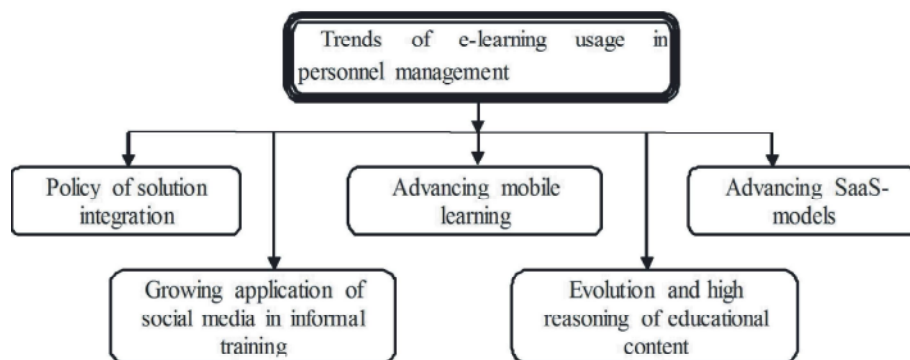

Fig. 1: Trends in E-learning use

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the imbalance between the technical capacities for storing and transmission of information in telecommunication networks and its presentation in various forms for influencing different sense organs of a human being on the one hand and requirements to information content in the network servers, structuring knowledge and selective access to information sources on the other hand [5, 6]. The information filling of the network servers and effective data management is the main problem and at the same time, it is the most difficult for implementation in terms of development of information and education environments in computer networks.

In relation to all mentioned above, one of the topical trends in reforming the modern educational system is a systemic integration of information and telecommunication technologies into the educational process and education management, as well as the development of the methodology for working with remote audience [7, 8].

Developing the Information and Education Environment of a Higher Educational Institution: The problem in using the information and communication technologies (ICT) in education is acute for technical institutions working with geographically spread audience. This problem was actively solved by the North-West State Distance Technical University (NWTU) with its 39 branches and representative offices (at present NWTU is merged with the National Mineral and Raw Material University "Gorny"). Open educational space of the university based on the interaction of the educational centers with the central training and consulting office provided high-quality education for the population residing in the territory of about 17 000 square kilometers (Fig. 2).

The NWTU experience shows that main principles of on-going training are as follows.

- Multi-level educational programs;
- Pedagogic support of educational technologies;

Forming the supporting environment (informational, communication and individually-oriented).

Using ICT for the university with such wide-spread audience is a vital necessity, therefore NWTU developed the information and education environment (IEE) based on the integration of pedagogic and information technologies.

Fig. 2: Educational space of NWTU

IEE includes the base of educational materials, means for their development, storage, transmission and accessibility and is based on the didactic and scientific and technical provision of NWTU aiming at developing the effective forms, methods and technologies for training specialists, combining training and professional activities, considering the regional needs.

For many years the University worked in close contact with such regional industrial giants Izhorsky plants, Kirishinefteorgsintez, Electrosila, Apatity and Kostomukshsky mining and enrichment plant. Personnel for Plesetsk cosmodrome, aluminum plant in Volkhov and many other enterprises were trained. In the cities of the region hosting the mentioned companies, there were NWTU branches, where the range of specialties was agreed with these enterprises. Competence of future specialists at such cooperation is formed considering not only the basic standards but the requirements of the regional enterprises. Practicums and laboratory works are organized at the enterprises and the term and diploma
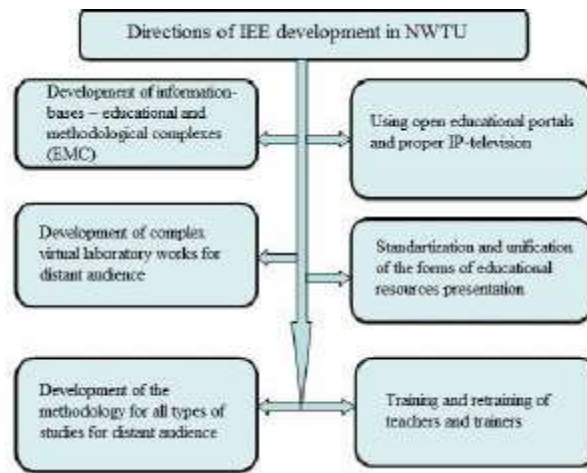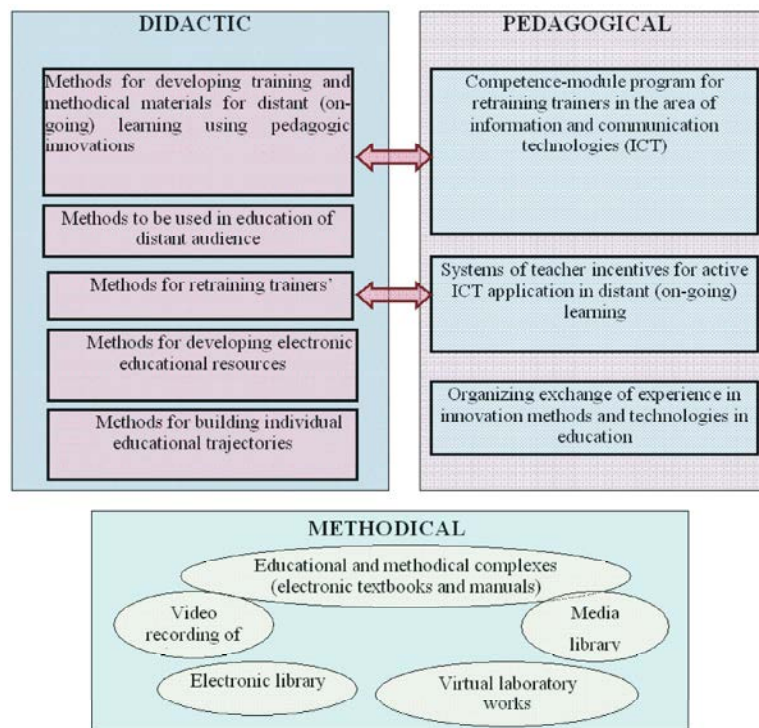
Fig. 3: Directions of IEE development in NWTU

Fig. 4: Didactic, methodical and pedagogic provision for distant learning

works are prepared according to their requirements; many of the results of these works are immediately introduced in production.

However, apart from the students who study in the branches and large regional cities, in NWQTU there are thousands of students residing in remote villages, shift-workers, who go to sea; and for such students it is rather problematical to organize practical and laboratory work at large enterprises. Many of such students cannot come to Saint Petersburg for long-term examination sessions and work in the university laboratories. For this group the role of ICT drastically increases. Using ICT for the purpose of distant learning is extremely efficient since students can work in a convenient work mode and study the technological processes, devices and mechanisms not in the plant shops or laboratories but using computers and video.

So, IEE was developed in the following directions (Fig. 3):

Development of a Study Guide for the Information and Education Environment of the University: The authors' experience and analysis of related literature [9, 10] allows stating that modern information and education environment (IEE) of any university shall be based on didactic, methodical, pedagogical, scientific and technological provision of efficient forms, methods and technologies for training specialists. The following components and interaction of main types of IEE provision may be suggested (Fig. 4):

It should be noted that education and information complexes, structuring of knowledge and IEE building in the form of network encyclopedia is the first but rather useful step on the way of further intellectualization of DL systems.

To distribute the educational mechanisms for training specialists combining educational and professional activities it is necessary to elaborate the complex method of information and communication usage and classical training technologies: Internet technologies, computer and case-technologies. The percentage of these technologies should be regulated depending on the studied subjects, students' specialties and location of the branch or office.

Organizing Laboratory Works and Practicums for Distant Audience: Communication between students and teachers is the most important factor in specialists' training; therefore, the NWTU realized a complex approach to information and communication and classical educational technologies and performed enormous work developing the methodology for laboratory work and practicums using ICT. Two main directions of this work may be distinguished.

First: Individual laboratory and practical classes for the students using distance learning technologies (DLT).

Second: Classes for groups of students located in a remote branch of the University.

The first type of work may be realized both in off-line and on-line modes. The basis of the classes in any case is developing the detailed methodical instructions for a laboratory work to be placed at the training site of the university, in Moodle system.

In off-line mode the students follow the detailed methodical instructions and perform laboratory works based on Microsoft Office program package: edit and format electronic worksheets, develop databases and simple expert systems, process statistical data, develop programs, create dialogue forms and etc. Having completed their works they send the resulting files directly to the teacher for reviewing. If necessary, the teacher introduces corrections into files and returns them to students with appropriate comments. This method was widely used during laboratory and practical works within the subjects "Informatics", "Databases", "Applied programming", "Methods and means for processing economic information", "Probability theory", "Information systems in economics" and etc.

A successful form of work with distant learners is forums. The teacher determines the theme and time of a forum and places a list of problems and questions on the university site. Every participant of the class sees all questions and answers of other active participants on a computer screen. In forums it is possible to attach files at information transmission that is important if it is necessary to use pictures, formulae and text fragments.

The experience shows that it is better to organize the subject forum for each theme of a course. It will allow the participants of the training process to be better oriented in space and time, that is important since the studies may continue for several days and better control questions and answers.

The principally new is developing of the method within the second direction, namely, classes with groups of students located in a remote university branch. NWTU realizes all types of classes (lectures, laboratory and practical works and controlling tests) with the groups of students located in Vyborg, Velikie Luki, Kirovsk, Udomlya, but for now, only for the first-year students.

Lecturing is performed by translating presentations through the Internet networks using the program Adobe Connect Pro. The method of such lecturing was mastered by NWTU in full and for six years, lectures for remote audience were delivered for sixteen branches and structural university subdivisions. In this case, the teacher is positioned in a specially equipped room in Saint Petersburg and the students – in the room in a branch equipped with computer, projector, screen and microphone to provide a feedback.

From academic year 2008/2009, all types of classes in general subjects: informatics, engineering graphics, mathematics, chemistry, Russian history and economic theory were organized first time for six remote NWTU branches.

Table 1: Comparative academic performance of students in Vyborg branch studying with traditional method and applying ICT

Type of control	Grade	Percentage for students applying ICT	Percentage for students applying traditional forms of education
Term paper	5	25%	20%
	4	55%	50%
	3	20%	30%
Examination	5	15%	15%
	4	40%	40%
	3	45%	45%

The methods used in different subject classes are, in this case, diverse. For example, in laboratory works in informatics the students are first presented with brief theoretical material (presentations and programs Adobe Connect Pro are used), then they are proposed to perform fragments of independent assignment. The students are placed in a computer class with available projector and screen. They see the assignment on a screen and start doing it with their computers. The teacher meanwhile switches from the program Adobe Connect Pro to the program Remote Office and receives an opportunity to go over the monitors of any computer using Controlle function; besides the teacher can control the student's computer.

It is difficult to use a computer class in the branch during the classes in mathematics, since far from all students can quickly and correctly enter formulae. Therefore, the teacher uses a digital tablet and the students introduce answers using a document camera. During the classes in engineering graphics, instead of an expensive document camera the scanner was used for sending students' answers.

The results of controlling events (tests and examination), based on the analogous method demonstrated the academic performance of the same level as at a stationary work of the teacher in the office (Table 1).

As it is apparent from Table 1, grades for practical works (term works and tests) at new educational form increased.

This statistics proves the perspectiveness of the proposed method for practical and laboratory works for the remote audience.

Pedagogic Provision of the Training Process: An important component of organization of the training process for the remote audience is preparation of teachers to usage of information and communication educational technologies [11, 12]. Specify in more details this area of educational process. The solution to the problem of retraining trainers is an educational program "Information technologies in education" realized in module-structured format. For several years the university trained teachers on the educational program "Information and communication technologies". At the first stages of work the teachers were trained within the common program. The audience was familiarized with technical and didactic aspects of computing and telecommunication means, the method for development and use of methodical complex and organization of classes for remote audience.

However, while teachers gained experience in preparation and organization of classes using ICT, the necessity of their training differentiation and inclusion of new trends in educational programs appeared (development of testing databases and score and rating system, development and use of virtual laboratory works, etc.).

Further training trainers was based on a module system. The learners, who only started using ICT, took full educational course of 160 hours. The teachers who already had certain experience in innovation technologies, received a chance to build an individual educational trajectory selecting some modules of the educational program: "Didactics of integrated information technologies (preparation of educational and methodic complexes)" - 72 hours, "Pedagogics of information technologies in the classes for remote audience" - 40 hours, "Modern technologies in education. A teacher and distant learning" - 40 hours, "Methodical and didactic bases for development of an academic evaluation of students' results" (preparation of test databases)" - 40 hours, "Fundamentals of virtual laboratory works" - 40 hours. To complete training on the training program every learner shall take 160 hours (8 hours for defending the final work and examinations in the taken courses). The so organized training program allows considering the level of teachers' competence and provides knowledge according to the learner's interests.

To provide continuous teachers' training process the educational program is annually added by new modules (principles of development and introduction of score and rating system, fundamentals of academic credit system, development of master's programs, etc.).

CONCLUSION

Thus, based on the experience of North-West Distance Technical University, it may be noted that to organize optimal training of the engineering specialists at the conditions of remote audience it is necessary:

- To develop the information educational environment based on the complex of didactic, methodical and technical provision; develop information-education complexes in all university disciplines, as well as an electronic library and a library of virtual laboratory works;
- To organize close cooperation with the enterprises for which the specialists are trained; develop training trainers programs considering the requirements of real economy, organize significant number of practical and laboratory works on the basis of enterprises attracting their leading specialists;
- To develop the method for all types of classes for remote audience using modern information and communication technologies;
- To organize the on-going training programs for trainers. Only the ongoing training for teachers may guarantee high level of education in the university and allows providing ongoing training of specialists.

As a result of a module system of retraining every teacher is provided with an individual educational trajectory and receives the complex knowledge necessary for efficient use of modern educational technologies in their disciplines. Within the university it provides wide involvement of the faculty professors and teachers in the process of formation of single information and educational environment.

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