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PROSPECTS OF THE DEVELOPMENT OF THE MODERN EDUCATIONAL INSTITUTIONS' LEARNING AND RESEARCH ENVIRONMENT: TO THE 15TH ANNIVERSARY OF THE INSTITUTE OF INFORMATION TECHNOLOGIES AND LEARNING TOOLS OF NAPS OF UKRAINE

During 15 years the Institute of Information technology and training of NAPS of Ukraine carries out research work aimed at solving actual problems of the creation, implementation and use of ICT in education, construction and development of computer-based learning environment of open education and e-learning, electronic educational resources, managing and supporting of the researches, technologies of cloud computing.

The article considers the main activities of the Institute of Information Technologies and Learning Tools of NAPS of Ukraine. The experience of actual pedagogical issues developing, cooperation among research institutions and universities within activities of joint research laboratories, are reflected. The prospective research directions that will contribute to the modernization and further development of modern learning and scientific environment of educational institutions of Ukraine, in particular, the introduction of cloud oriented tools and technologies, the learning e-resources quality assurance, are outlined.

The aim of the paper is to outline the main activities of the Institute of Information technology and training of NAPS of Ukraine during last 15 years and reflect the experience and perspectives of scientific and pedagogical cooperation of national research institutions and universities.

Key words: learning and scientific environment, science and research institute, university, information and communication technology, cloud computing, quality.

Statement of the problem. During 15 years the Institute of Information technology and Learning Tools of the National Academy of Pedagogical Sciences of Ukraine carries out research work aimed at solving the problems of development, implementation and use of new learning tools and information technologies in education; construction and development of computer-based learning environment of open education and e-learning, electronic educational resources, management and support of the researches, exploration of cloud technologies. A number of important theoretical and applied results were achieved in recent years.

The relevance and the urgent need for these studies is caused mostly by the need to implement a modern educational paradigm, which consists in providing an equal access to high-quality education for everyone who needs to learn, who has the desire, the need for lifelong learning [3].

Theoretical results and practical orientation of the researches conducted at the Institute are mainly subordinated to the specified educational paradigm, aimed at the development of scientific and methodological foundation of implementing the principles of open education. According to numerous studies, the implementation of the principles of open education is the backbone of the formation of global education systems, development and upgrading of educational and research environments, perspective way for national education system developing [3].

Analysis of recent researches and publications. Ukraine has achieved significant results in the study of theoretical and methodological basis of modeling and designing of information and educational environment of open education (V. Bykov, M. Zhaldak, G. Kravtsov, V. Kukharenko, A. Manako, L. Panchenko, S. Semerikov, A. Spivakovskiy and others). In particular, in V. Bykov's works the models of organizational systems of open education are designed; the models of common information educational environment are proposed (methodical systems of e-learning, model of educational management in its different organizational levels, modern informatics teachers' training in higher educational institutions and others) [3]. This works will create the methodological basis for further researches in this area, given that cloud oriented environment is a new step in the development of open education.

General trends of implementation of promising ICT, including cloud technologies, into organization of educational systems were studied in the works of V. Bykov, M. Zhaldak, Y. Zaporozhchenko, S. Litvinova, N. Morze, V. Oleksyuk, S. Semerikov, A. Stryuk, M. Shyshkina and others. The works of M. Zhaldak, O. Grybyuk, S. Semerikov, V. Kukharenko, Z. Seydametova were devoted to psychological and educational aspects of the formation of personalized learning environment.

Taking into account the significant pedagogical potential and novelty of the existing approaches to the design of educational and research environment, its formation and use in educational institutions, these questions are still in need of theoretical and experimental studies, refinement of approaches, models, methods and techniques, search of the possible implementation ways.

The aim of the paper is to outline the main activities of the Institute of Information Technologies and Learning Tools of NAPS of Ukraine during last 15 years and to reflect the experience and perspectives of scientific and pedagogical cooperation of national research institutions and universities.

The main material. Institute of Information Technologies and Learning Tools of NAPS of Ukraine was established on June 16, 1999 by the decision of the Presidium of the Academy of Pedagogical Sciences of Ukraine under the Resolution of Cabinet of Ministers of Ukraine on June 7, 1999.

One of the main initiators and the first director of the Institute **Valery Bykov** became. Scholar, teacher, organizer of science and education known in Ukraine and abroad, V. Bykov still brilliantly performs his duties as an acting Director.

Currently the Institute is leading institution among the national education research institutions, which mission is to conduct fundamental and applied researches aimed at solving urgent theoretical, methodological, scientific and methodical problems of creation, implementation and use of ICT in education. The Institute's activity is due to the need of implementation of the new challenges which Ukraine education is facing, and which require the formation of a qualitatively new learning environment that would meet modern educational needs of the human, the condition and future trends of scientific, technological and socio-cultural development of society, the latest achievement of psychological and pedagogical science, educational practice in Ukraine and abroad.

The main activities of the Institute are [1; 5]:

- *Scientific and research*: developing of the scientific issues and conduction of the experimental studies on the creation, development and application the latest learning tools in the educational process in national educational establishments of different levels: information learning tools, computer software for educational purposes, Internet sites, Internet portals, computer-oriented learning systems and other electronic tools and resources, Internet-oriented databases and databanks of scientific and pedagogical data; systems of distance e-learning, distance audio- and video-telecommunication learning tools, multimedia and computer interactive learning tools, tools for displaying and presentation of computer data; automated modeling, expert and virtual learning systems; new and typical architectures of computer complexes and kits; computer-based learning environment including systems for open education and distance e-learning systems; automated

systems for test evaluating the impact of advanced tools and ICT to the results of learning activities; automated systems of scientific research.

- *Research and experimental*: the creation of a network of research centers, pilot schools, experimental platforms on the issues of the Institute activity; organization and implementation of pedagogical experiments in pilot schools for working on the latest learning tools, ICT and methods of their application in educational practice, e-learning and distance education.

- *Projected and technological*: the development of specifications, standards, scientific methods of application and certification of learning tools, kits and complexes and their industrial production; development of scientifically based standards for educational institutions' equipping , and technical tools for different learning disciplines.

- *Scientific and coordinating:* coordination of research, project and production activity of educational establishments, research institutions and industrial enterprises in sphere of creation and using of advanced learning tools and ICT in educational practice.

- *Scientific and methodical, and educational*: learning, synthesis and dissemination of advanced national and foreign experience on the issues of the Institute; assisting the educational establishments, scientific institutions and industrial enterprises in sphere of implementation of the tools of new generation, ICT, distance technologies for e-learning; qualified scientists training (candidates and doctors of sciences) through postgraduate courses; professional development and training of scientific and pedagogical staff in the areas researched at the Institute.

- *International cooperation* with foreign universities, research institutions and industrial enterprises which investigate and solve related problems; conduction of joint researches, programs and projects [1; 5].

The research workers of the Institute are recognized experts in theoretic and applied researches in sphere of educational and scientific information and communication technologies. Each year they enrich the national scientific and educational environment by the results of their research findings and achievements in form of monographs [9; 11; 12; 13; 20; 23; 25; 27], manuals [18; 21; 24; 15; 14; 8], guidelines [26; 19; 34], a number of publications in professional, international, and other editions [10].

The rapid improvement of new technology tools, software products, network hardware and software for educational purposes causes the transformations in society that affect both the basic educational paradigm, form and content, technologies of support of e-learning, and the interaction of science, technologies and manufacture [17; 31].

Therefore, an important task is to develop learning and research environment of educational institutions of Ukraine considering the latest developments in the field of scientific and technical progress.

One of the possible ways for this implementation is the organized cooperation among research institutions and university sectors, organization of joint research laboratories within the cooperation agreements to implement the results of research, involving representatives of educational institutions to scientific researches, improvement of teaching staff training, encouragement of participation in the development of joint projects of sector, national, and international levels [31].

Establishment of joint research laboratories contributes to the spreading of the experience of activity management and results; organization of joint events of sectoral, national, and international levels; improvement of the organizational techniques of research results' implementation; overcoming of potential gaps between conducting scientific researches and their practical use.

This approach can contribute to the development of university autonomy, which is the aim of current reformations in higher education, and is consistent with the adoption of the new Ukrainian Law on Higher Education [28].

By developing the links with research laboratories the research areas of scientific and educational institutions are coordinated.

In this structure the processes of forming of research subject are improving, and thus the researches direct at those pedagogical issues, the need for addressing which appears currently in

educational space. This way the mechanisms of the research results' implementation are improving. The processes of teaching staff training occur in close cooperation between researchers and teachers, in interrelation of educational process and scientific research.

On the basis of modern network technologies the possibility to appeal to the remote educational resources online appears. For example, it can be realized with the use of virtual laboratories and laboratory systems remote access, university resource rooms and laboratories for conduction of demonstration experiments [29; 31]. Therefore, the links between institutions develop on basis of "school- vocational school-university" model.

In recent years, tools and technologies of information and communication networks have been further developed, in particular, on the concept of cloud computing. This concept significantly alter the existing understandings of the organization of access and applications integration, so it becomes possible to control a large ICT-infrastructures that allow you to create and use independently both individual and collective "clouds" within the overall cloud-based educational environment [4; 30; 32].

Formation of high-tech learning environment based on cloud technologies, which would unite educational resources for learning purposes, support of scientific research, and cover different learning levels (training both specialists and higher qualification staff), could promote solving these problems, overcoming the gap between the scientific search process, and the level of implementation and use of its results [31].

Trends associated with the processes of integration of higher school educational environments, suggests their participation in regional clusters formation. Clusters are a form of cooperation in the field of scientific, research and innovative activity, and are formed through the merger of companies and organizations relevant to a particular kind of industrial activity [7]. Cooperation can take the form of information exchange, resource sharing, pooling in terms of staff training and employment. In particular, one of the advantages of university clusters is the transfer of non-core functions of organizing and maintaining of the university ICT infrastructure functioning to the experts. To realize this purpose a separate IT department is created in the cluster [7; 31]. Thus, the functioning of the high-tech infrastructure is conducted from a single center through outsourcing, i.e. ICT services required by system are implemented through another external system.

The trend towards consolidation of higher educational institutions has gained acceptance abroad [22; 30], and is manifested in Ukraine. It consists in creation of regional universities, which may contain several higher educational institutions. Implementing a shared technological platform of the regional educational institution functioning on the basis of cloud computing is a way to solve a number of problems that arise when combining infrastructural ICT in a network. In its turn it allows access to the best examples of electronic educational tools and resources to those institutions that don't possess the necessary financial support and powerful ICT units [31].

Besides, within the interaction network the university cooperation with academic organizations and business structures can be realized, the processes of training, skills development, international projects implementation, linkages between schools and universities can be conducted.

This is consistent with the prospect of creating of integrated (sectoral, national) databases, data collections, resources that are made available to various educational institutions [6; 29; 33]. In order to take advantage of such collections in full, it is also useful to implement tools of cloud computing [31].

An important direction of development of educational institutions scientific and learning environment is to improve the quality of electronic educational resources and services used in the learning process.

In order to promote research in this area, Institute of Information Technologies and learning Tools of NAPS of Ukraine implements the relevant scientific work on the topic: "The system of psychological and pedagogical requirements to ICT for educational purposes", which has been conducting at the Institute during 2012-2014, and is a continuation of researches aimed at improving the quality and effectiveness of ICT implementation into learning process at the present stage of educational reforms.

As a result of research conducted by the Department of Informatisation of Educational Institutions of the Institute, the collecting, analysis and systematization of the main types of educational software for secondary schools by compiling a database of vehicles that are certified by Ministry of Education and Science (MES) were made. The most appropriate ways to use these tools in accordance with the main types of cognitive and educational activities were analyzed. The classification of educational software that can be the basis for identifying groups of quality indicators that are most affecting the formation of certain types of educational competencies were conducted. The most common methods of quality evaluation used in expertise of the educational electronic tools quality were examined; their advantages and limitations were highlighted. The main groups of parameters of quality assessment that can be used in developing techniques and methods for assessing the quality learning e-tools were defined [16]. The technologies of certification of educational software, the national and foreign regulatory basis for quality evaluation of this type of tools were researched. The model of e-tools quality certification prescribed in international standards of software quality management was proposed.

As a result of the research work the system of scientifically grounded psychological and pedagogical requirements to ICT for computer-oriented educational environment were developed; scientific and methodological basis for the expertise of educational e-tools quality, and these tools' classification were grounded; the proposals to projects of relevant regulatory documents, including the Regulation on electronic educational resources approved by the MES of Ukraine (Decree № 1060 of 01.10.2012.) were submitted.

These results will promote the improvement of technology of ICT quality assessment, the development of the e-learning legal framework, the forming of modern learning environment with the use of ICT in educational institutions.

To carry out research and experimental activities, implementation and dissemination of the results in 2011 the research laboratory common with Kherson State University was created in conjunction on issues of educational quality management with the use of ICT. The main objectives of the laboratory was defined as follows:

- coordination of research projects on the use of information technologies, executed in Kherson State University and Institute of Information technologies and Learning Tools of NAPS of Ukraine, other universities, and institutions of NAPS of Ukraine;

- direct implementation of joint research projects according to the main areas of research, and the concept of education informatization, the introduction of information technologies into the educational process approved by academic councils of the Institute and the University.

Due to the program of joint research work the Kherson State University was approved as an experimental base for research on the definition and experimental verification of didactic requirements and methods of evaluating of quality of electronic learning resources in the educational process in pilot schools (Kherson Physical-Technical Lyceum, Educational complex "School of Humanitarian Work", Kherson Academic Lyceum named after O. Mishukov, Kherson Specialized School # 30).

The purpose of the experiment carried out is to identify and experimentally verify the requirements and methods of evaluating of quality of electronic learning resources (ELR) in the educational process in secondary schools. The main objectives of the experimental work of the joint research laboratory are:

1. Provision of organizational, information and communication, scientific and methodical, guidance and logistical support of the experiment participants.

2. Development of ELR quality criteria and experimental verification of the efficiency of their use for ELR quality monitoring.

3. Creation of organizational forms and implementation of methods of evaluating of electronic learning tools quality in the educational process.

4. Summarizing and development of the recommendations on the use of methods of electronic learning resources quality evaluation in the educational process.

In May 2014 under the program of experimental research an expert committee of 25 people was established; on the basis of expert assessments method the types of ELR were approved; the indicators of quality for each type of ELR were defined; the expertise of ELR started.

Estimated social impact of the research is that the results will contribute to the modernization of learning and research environment of educational institutions, to improving of quality of information and communication technologies, to the effectiveness of implementation of tools and services of cloud computing into the learning process, to the increasing use of the best examples of ELR, improvement of quality of organization and conduction of educational, scientific and experimental work.

Application of the results of this research work can be carried out in the secondary, higher and further pedagogical education, and be used by scientists engaged in research activities aimed at the development of ICT in education, and also be used by teachers for exploring the general trends of learning ICT quality assurance.

Conclusion. During 15 years the Institute of Information technology and Learning Tools of the National Academy of Pedagogical Sciences of Ukraine carries out research work aimed at solving the problems of development, implementation and use of new learning tools and information technologies in education; construction and development of computer-based learning environment of open education and e-learning, electronic educational resources, management and support of the researches, exploration of cloud technologies.

Currently, technologies of cloud computing constitute a promising direction of development and improvement of electronic resources, because this concept is a unified methodology of common platform, the basis for development, testing, improvement of integrated methods of ICT quality assessment. Due to services of cloud computing the way for the development of more powerful methods of multiple accesses to electronic resources is opened, including creation of better software products for educational purposes on this basis.

The reasoning of psychological and pedagogical, technical and technological, and other requirements to educational ICT, the definition of principles and promising ways of projecting and developing of the institution educational environment, in particular, using technologies of cloud computing is a promising direction of ICT quality improving.

One of the main reasons for the lack of educational ICT quality is that the theoretical foundations of projecting of educational environment and quality management of ICT tools are underdeveloped. Therefore, the definition of indicators of ICT quality criteria, creation and use of methods of complex evaluation of their quality in learning process arise as a factor of improvement the quality of education.

A promising solution of these problems is a development of cooperation between research institutions and universities through the organization of joint research laboratories that may contribute to the spreading of the experience of activity management and results; organization of joint events of sectoral, national, and international levels; improvement of the organizational techniques of research results' implementation; overcoming of potential gaps between conducting scientific researches and their practical use.

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ПЕРСПЕКТИВИ РОЗВИТКУ СУЧАСНОГО НАВЧАЛЬНО-НАУКОВОГО СЕРЕДОВИЩА ОСВІТНІХ УСТАНОВ: ДО 15-РІЧЧЯ ІНСТИТУТУ ІНФОРМАЦІЙНИХ ТЕХНОЛОГІЙ І ЗАСОБІВ НАВЧАННЯ НАПН УКРАЇНИ

Упродовж 15 років Інститут інформаційних технологій і засобів навчання НАПН України здійснює науково-дослідну роботу, спрямовану на розв'язання актуальних проблем створення, впровадження і використання інформаційно-комунікаційних технологій в освіті, побудови та розвитку комп'ютерно орієнтованого навчального середовища систем відкритої освіти й електронного дистанційного навчання, електронних освітніх ресурсів, управління та підтримування наукових досліджень, дослідження технологій хмарних обчислень.

У статті розглянуто основні напрями діяльності Інституту інформаційних технологій і засобів навчання НАПН України. Відображено досвід розроблення актуальних педагогічних проблем, взаємодії науково-дослідної установи та університетів в межах діяльності спільних науково-дослідних лабораторій. Окреслено перспективи розвитку досліджень, що сприятимуть модернізації й удосконаленню сучасного навчально-наукового середовища освітніх установ України, зокрема, впровадження хмаро орієнтованих засобів і технологій, підвищення якості електронних освітніх ресурсів і сервісів, що використовуються у навчальному процесі вищих та загальноосвітніх навчальних закладів.

Метою статті є окреслення основних напрямів діяльності Інституту інформаційних технологій і засобів навчання НАПН України упродовж 15 років та відображення досвіду і перспектив науково-педагогічної взаємодії національних науково-дослідних установ і університетів.

Ключові слова: навчально-наукове середовище, науково-дослідна установа, університет, інформаційно-комунікаційні технології, хмарні обчислення, якість.

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ПЕРСПЕКТИВЫ РАЗВИТИЯ СОВРЕМЕННОЙ УЧЕБНО-НАУЧНОЙ СРЕДЫ ОБРАЗОВАТЕЛЬНЫХ УЧРЕЖДЕНИЙ: К 15-ЛЕТИЮ ИНСТИТУТА ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ И СРЕДСТВ ОБУЧЕНИЯ НАПН УКРАИНЫ

На протяжении 15 лет Институт информационных технологий и средств обучения НАПН Украины осуществляет научно-исследовательскую работу, направленную на решение актуальных проблем создания, внедрения и использования информационно-коммуникационных технологий в образовании, построения и развития компьютерно ориентированной учебной среды систем открытого образования и электронного обучения, электронных образовательных ресурсов, управления и поддержания научных исследований, исследования технологий облачных вычислений.

В статье рассмотрены основные направления деятельности Института информационных технологий и средств обучения Национальной академии педагогических наук Украины. Отображен опыт разработки актуальных педагогических проблем, взаимодействия научно-исследовательского учреждения и университетов в рамках деятельности общих научно-исследовательских лабораторий. Очерчены перспективные направления исследований, которые будут способствовать модернизации и дальнейшему развитию современной учебно-научной среды образовательных учреждений Украины, в частности, внедрения облачно ориентированных средств и технологий, повышения качества электронных образовательных ресурсов и сервисов.

Целью статьи является определение основных направлений деятельности Института информационных технологий и средств обучения АПН Украины на протяжении 15 лет и отражение опыта и перспектив научно-педагогического взаимодействия национальных научно-исследовательских учреждений и университетов.

Ключевые слова: учебно-научная среда, научно-исследовательское учреждение, университет, информационно-коммуникационные технологии, облачные вычисления, качество.