

NETWORK STRUCTURES AS A FACTOR OF VIRTUAL ACADEMIC MOBILITY DEVELOPMENT

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The article represents a model of forming network distributed structure of professional development of scientific and pedagogical personnel, created on the basis of innovative Russian universities to distribute their experience on introduction of innovative educational programs results and application of new educational technologies. Network structures and network interaction are regarded as factors promoting development of virtual academic mobility.

Development of contemporary society is characterized by globalization, expanding integration of national economies, social systems, science and education, processes picturing peculiarities of transition to society of knowledge, forming which suppose definite correction of state strategic development directions and improving educational paradigm.

Strategic direction of national educational systems in Europe is large-scale reform of education internalization, pointed at national educational systems approaching, united educational area forming, international competitiveness of European education increasing, mobility development and increasing demand for specialists on labor market. Russia integration into international educational area is an evident and inevitable process, this emphasizes a problem of academic mobility, providing students and professors with a huge choice of programs, forms and methods of education, creation of system of interuniversity network interaction, providing effective informational exchange, informational and consultation universities assistance in activization their participation in process of integration in educational sphere. Universities must not only cooperate, but implement support of academic students and professors' mobility, assist boundless cooperation between every side, interested in development of higher education sphere [5].

Success in this aim solving depends significantly on improvement of professional development of educators system, providing support competence development of a personality; this is one of the main aims of innovative educational activity.

Results of prior national project "Education" (PNPE) implementation in 2006 – 2008 showed that Russia accumulated necessary experience for organization of personnel professional development to provide innovative educational activity, increase quality and mobility of education within universities. Innovative educational programs implementation creates conditions for forming and development of research competences, providing education quality increasing due to introduction of innovative developments into educational process and innovative processes management in university. Necessity is ripe and conditions are created to distribute experience of innovative universities for mass and systematic usage of results received. Development of network interaction of educational institutions must assist it to develop professional education and science, strengthen connections with real economy more effectively and systematically. Network interaction

becomes one of the most effective mechanisms of educational activity development and solves actual tasks of education modernization, development of virtual mobility in education [3, 7].

The most systematic effect from using innovative universities potential can be reached through uniting their efforts and resources within united net, providing effective interuniversity interaction when realizing scientific and educational programs of different levels, carrying out scientific researches and developments.

An open contest “Development of innovative universities network interaction as a basis for mass usage of results, received during realization of innovative educational programs to develop professional education and science more effectively and systematically and to strengthen its connection with real economy” was organized in 2008 to create open network of system constituent innovative universities, providing mass distribution of leading practices and innovative results in a system of professional education. The contest was organized by Federal Agency of Education within Federal program of education development for 2006-2010.

Contest was organized on five directions of results distribution, received during innovative educational programs implementation by universities, including creation of network distributed structure of professional development of educators and scientific personnel, this is the main task of a project, which Tomsk State University is carrying out.

The basis of project implementation is design of a network distributed structure model of professional development of university personnel on introduction results of innovative educational programs and using new educational technologies. Model is created basing on distributed structure and informational system of educational and scientific institutions network interaction.

It should be mentioned that under network interaction we understand interaction of active agents, each one of them, depending on the situation and task being solved, can act as managing subject as well as managing organ or center, or as a meta center, implementing development other centers management, etc [11].

Difficulty in network interaction development is conditioned by the fact that functional elements of organizational system are characterized by possibility to perform various roles that means solving different tasks with different effectiveness and from the other hand it is conditioned by diversity of these tasks and fast change of external conditions of functioning.

Blending of various variant of network interaction development occur during forming of network distributed structure and informational system of network interaction in the sphere of professional development of institutions of higher education and science. This blending is being displayed in forming tasks of interregional and interuniversity interaction, project approach to design joint educational programs, interaction of various teams and project groups within university.

Under network interaction we understand interaction of independent subjects, implementing on the basis of network technologies. Using such an approach we name the following as indications of network interaction: autonomous status of each subject, voluntary character of participation in mutual task solving, constant availability of joint activity materials for all subjects of network, possibility to use telecommunicational networks in interactive mode.

As main characteristics of network interaction we mean united interaction environment, multitude of connections, including interdisciplinary, non-linear character of interaction, open form of interactional exchange with external environment.

Network structures, based on horizontal connections, create synergetic effect, stimulating creative interaction of elements which are in network. Synergetic effect, reached during joint educational activity, is significantly connected with functioning of self-organizing systems, education can be named among them [2, 6].

Organization of open model of education, basing on neoclassic world perception, synergetic points of view on nature and society, world outlook and methodological pluralism, forms new understanding of education informatization problem as a process of integration of scientific and education activity into united informational process [4]. Concept of network interaction realizes totally when information technologies and high-speed telecommunication develop swiftly, informational streamlines increase dramatically, it is considered to be a basis for scientific and educational environment, providing equal rights and abilities for network members such as scientific and educational institutions, professors and students.

Network interaction allows developing synergetic approach in researches of education and implements its synergetic effects in joint scientific and educational activity. Network interaction in educational is modern activity in educational institutions, pointed at improving quality of educational activity and consisting in experience exchange, joint design and using innovative, methodical and personnel resources. Term “network interaction” should be correlated with “network technology”, which is related to technical and technological resources more often. “Network technology” can be determined metaphorically as “a mean of “network interaction”. It should be mentioned that network technology can define as a way of technical interaction as well as a way of educational institutions interaction.

Joint (network) educational programs are programs developed and implementing by two or more educational institutions to increase quality of education basing on development of academic mobility of students (possibility to receive educational services in different educational institutions within one program) as well as educators (teachers exchange, giving courses, using methodic resources of universities – partners).

Within program offered, network interaction is organized basing on information and communication technologies. This approach was chosen due to existing experience of network interaction implementation during websites, portals, telecommunicational networks creation and exploitation. As its advantage we can name high speed of information search and transfer, widening of informational field, participation visualization, access to structural information facilitation.

Model design is based on analysis of existing forms of professional development of educators and scientific personnel of universities on introducing innovative results of PNPE and implementation new educational technologies.

An important condition of model forming is analysis of experience in network structures creation, organization of network interaction in education and realization of joint educational programs of professional development which exists in Russian Federation.

The basis of analysis is researching experience in organization of professional development of professor and scientific personnel of universities network system within implementation of innovative programs. Research of programs implementation experience basing on network interaction and using informational and telecommunicational technologies, organizational

experience in distributed education and network interaction of Russian universities, pointed at development of academic mobility, virtual as well.

Interesting experience in organization of network structures and network interaction is connected with integration of Russia into international educational area. Project “Network interaction of universities on main directions of Bologna process basing on informational and telecommunicational technologies”, realized within Federal target program “Development of united informational educational environment”, was pointed at solving this task. Experience received during implementation of this project allowed working out and discussing various variants of ICT support of network interaction with potential participants and offering probable models of further development, including federal programs for 2006-2010 support. Network interaction organizational experience within this project is valuable in creation of informational interaction and informational network.

Joint educational activity was not stipulated; therefore organizational mechanisms of such activity were not developed [1].

Analysis of experience in network structures organization, development of network interaction and realization of joint educational programs proves that the most effective mechanisms of network interaction were developed by universities participating in association of educational and scientific institutions “Siberian Open University”, uniting more than 40 educational institutions. Creation a model of educational institution of an open type is connected with association activity. Such a model allows integrating scientific and pedagogical potential and informational and educational resources for increasing effectiveness and quality of education when preserving traditions and educational environment specificity [9].

In 2002 principles and mechanisms of joint scientific and educational activity of universities were grounded, creation of interregional university complexes based on associative model of educational institution were suggested. The core of a model was in organizing of joint programs by universities participating in association, branches of association as well as branches of these universities were supposed to be open on their basis. It was assumed that all universities start contract relationship with Association, which coordinates educational programs of all universities participating in so called “branch union” through branches, combining general courses for different universities participating in this activity. As a result of such an activity universities could attract professional and teaching staff of the highest qualification and students participating in the experiment could receive a possibility to be taught by the best professors in any university.

Idea of interregional university complexes creation faced problem of legislative base shortage for network interaction and joint educational activity basing on distant technologies, and apprehension of several universities that they will face serious rivals in their region represented by partners on association due to commercial independence growth. Absence of a law, regulating status, principles and technologies of distant education complicated solving this task.

Starting from 2004 new phase in joint educational programs of Association organization began, it was connected with organization of joint distant educational courses within universities own educational programs, but attracting personnel potential of other Association participants. Experience, accumulated by universities within Association “Siberian Open University” proves effectiveness and ability of organization of joint educational programs basing on network

interaction. This leads to expanding virtual academic mobility, developing of joint educational area, improving distant technologies.

Useful experience was received in network interaction between universities as a result of other consortiums activity and chains of educational institutions in informational and educational environment of open education (IEE OE) of Russian portal of open education in 2003 – 2005, in the chain inter municipal methodical centers of the Academy of National Economy from 2007, in the chain of professional development of professors and scientific employees of universities, created by Roseducation in 2005 on MIERA.

As an obvious advantage of the previous model we can state that its realization promotes development of academic mobility of educators, receiving possibility of professional development in leading and innovative universities on actual directions [10]. Abroad, the idea of network structures creation and network interaction organization is implemented through open universities, among which there is British Open University, Open University of the Netherlands, Open University of Madrid, etc. Peculiarity of European open universities is their aspiration to play leading role in distribution of higher and postgraduate education not only in the own country, but around the world. Alongside with it large open universities aim to develop its own inner chain, not connecting its programs with others. Many open universities invite scientist of international fame to participate in their programs and are ready to give them necessary methodical and technical support when courses developing and carrying out.

One of examples of international network interaction organization with Russian universities participation is European Association of International Education(EAIE), which is keen to combine specialists of educational institutions of different countries to help in organizing global environment, where education is mobile and available for everybody; and European Association of Universities of Distant Education (EADTU), which is organizing its members work through creation academic network on various subject matter: electronic education and learning; research in education sphere and educational technologies; libraries and support of education; science and technologies. One of the most important initiatives of this organization is “E – Bologna”, which is electronic core of Bologna process, in Europe its global aim is to create electronic environment for realization and development of virtual mobility creation of digital network, integrating national and regional universities into synergetic network of electronic education.

These are several examples of network structures organization and universities network interaction in the sphere of education, implemented from different approaches to organization of network interaction and understanding “network”. Results of the research carried out were founded of development of network distributed structure forming model of professional development of professors and scientific personnel of universities on innovative educational programs results introduction and using new educational technologies which contain all main elements of united educational environment, including infrastructure of resource centers and educational institutions, system of educational process support and management, system of quality monitoring of professional development , organizational, material and technical, technological and personnel support (<http://ppk.tsu.ru/>).

The basis for organizational support of the model is network of Resource Centers of Professional Development (RCPD), which are created basing on innovative universities of Russia in

all federal regions. It is innovative university which should become the basis of outstripping development of educational system, distributing of innovative experience in professional development of educators and scientific personnel of universities on introduction of results of innovative educational programs and using new educational technologies, organizing network interaction in the sphere of professional development of educational and scientific institutions.

This offer consider existing in the system of Russian higher education infrastructure of informatization, basing on resource centers of educational system informatization of different level, created within Federal Target Program “Development of united informational environment, 2001 – 2005” basing on leading Russian universities. Regional structure of resource centers informatization acquires especial meaning, which can be reorganized within present project and which allows solving more effectively set of questions, connected with technical, technological and personnel support, organization network interaction, gives possibility to use university potential. Tomsk municipal center of new informational technologies will provide active participation in organization of technical and technological support of RCDP TSU, Moscow State University of Electronic Technology – Moscow regional center of new informational technologies at MIET, Korolev State Aerospace University of Samara – Samara regional center of new informational technologies, etc.

Besides network of resource centers of informatization, created within Federal Target Program “Development of united educational informational environment”, was of hierarchical structure with vertical network, centralized management and subordination, uniform functional and crossing content.

Opposite to such a hierarchical network, resource centers network of professional development being created basing on innovative universities does not have hierarchical character and is of distributed type. It combines partners equal in rights, its “nods” (RCDP) have various functional and unique resources, not duplicating but supplementing each other in content and other types of activity.

Uniqueness of each university, on which basis RCDE is created, is defining criteria at innovative university selection to become supporting office of network interaction on professional development. So, Moscow State University of Electronic Technology possesses unique experience of technological clusters development, personnel training for Russian innovative system in the sphere of electronics; in Korolev State Aerospace University of Samara – experience of creation and development of competence centers and specialists of world level training in the sphere of aerospace and geoinformational technologies; in South-Ural State University – experience of personnel training in the sphere of energy-efficient technologies, etc. This is a guarantee of going away from competitive situation between universities, complementing professional development programs. Collaboration instead of competition is the only strategy acceptable for development of joint educational activity and network projects in education.

Principles of self-regulation, dominating in this network, define mechanism of interaction between network knots – RCDE, each of them performs definite function and content, which can change and strengthen at network interaction. Various projects (“temporary connections”) become the basis of network functioning, which are being formed for solving a task of a system. Vertical connections and collateral subordination collaboration of knots can change due to task being solved.

Methodology presented, explains principles of distributed structure of network interaction functioning and defines coordinating and integrating functions of RCDE, necessary for working out united politics on organization of distribution through professional development system of scientific and pedagogical personnel of innovative university experience.

RCDE interaction mechanisms are based on principles of distributing network structure functioning, mentioned above. This way RCDE are unique network knot, which interact on mutual programs creation, organization of distributed education, implementation of scientific project, etc. Task solving will be accompanied by changes in mechanism of relationship between network elements: each new task can lead to forming temporal hierarchical structures or several collateral subordinations.

This is evident on examples of offered mechanisms and universities interaction forms during creation and realization of joint programs of professional development.

1. “Centralized” form of universities interaction on design and realization of joint programs of professional development. In this case a program is created and approved by one university (considering information it possesses about other universities, which participate in network interaction, possessing similar educational programs about personnel potential of other universities, implementing such programs). To realize such educational program, created by one university, can attract professors from other universities (on the treaty of service rendering, or on combining jobs terms). Universities can make a treaty on cooperation, one of the condition of which would be universities assistance, professors from which are attracted to participate at realization of educational programs of universities – partners. This attraction should be provided (syllabus should be corrected in “home” university, considering syllabus in university-partner).
2. “Decentralized” form of universities interaction on development and realization of joint programs of professional development. Person, decided to improve professional qualification is free to choose module and university to study at. A person, learned definite quantity of modules (if total education duration is not less than 72 hours) and passed assessment on each of them, can apply in any university, where there is a program of professional development, including similar modules, and pass final assessment and get a certificate of short-term professional development. The second variant is possible only if a program was developed by several universities and is considered to be mutual (approved by each university and implement according to treaty of joint activity). In this case any participant of such a network can become leading for a period of concrete educational program realization. Whenever new group admission is carried out in another university, leading part transfers to university, conducting admission, etc.

Such an approach allows any university to become a member of network if it possesses unique potential for professional development system improvement and desires to participate in development and implementation of joint educational programs. Role of RCPD, created on basis of innovative universities, is concentrated on coordination of all network participant action, on organization of new network projects, creation and support of informational system of network interaction in the sphere of professional development.

Thus, distributed structure of professional development with supporting offices in the form of resource centers become self-organizing system, forming temporary connections for solving concrete project tasks. To manage created distributed structure it is necessary to create joint coordinating and expert bodies, which can coordinate and monitor all network participant activity, managing not university structures or not universities, but only projects, tasks, appearing in network.

Technical support of a model of network distributed structure of professional development suppose that universities-participants have network structure of modern technical means, necessary for organization joint educational programs on the basis of informational and telecommunicational technologies (ICT), allowing to organize TV and IP-broadcast perception, carrying out audio and video conferences, etc; to implement educational activity within ICT-saturated educational environment, which is a part of universities network interaction.

Modern multimedia complexes, PCs, network and educational institutions resources allow creating solid basis for network interaction basing on distant educational technologies. Creation of high speed telecommunication and design of technologies of real time give possibility to realize a model of distributed educational environment, built on technologies of remote computer means of communication.

Technological support of a model of network distributed structure of professional development is based on using modern informational and telecommunicational and educational technologies in educational process. To provide quality of education we need dynamic, oriented on practice technologies of education, allowing audience to form, develop and improve competence, necessary for further development, to solve professional tasks and making decisions critically and creatively.

System of multi server providing of educational process was developed to support educational programs technologically, including satellite broadcasting using satellite means of communication, video conferences through surface main and network on-called circuit, internet-broadcasting through ground-line communication, on-line access to educational portals, on-line and off-line technologies of pedagogical communication.

Using distant educational technologies and electronic educational resources allows making a system of educational process maintenance and control more effective when broadening forms of supplementary professional education. Pedagogical practice represents examples of using unique characteristics of social services through using open, free electronic resources, independent creation of network educational content, adoption of new knowledge and skills, observation and participation in professional community activity. Means and technologies of Web 2.0 – electronic portfolio, audio and video podcast, webcast, blogs etc are used when realizing network programs. New informational technologies give practically boundless possibilities in organization of joint scientific and educational activity. Creating databases, automated management of experimental complexes with remote access, creation of virtual labs, organization of video conferences – this is not all list of modern technologies facilities.

Technical and technological requirements complete each other and allow creating distributed educational environment, within which implementation of joint educational programs is possible, including professional development programs. Different types of ICT can be used depending on conditions of network education (technical equipment, education form, channel capacity). At that

informational educational technologies must be adapted to modern conditions and pedagogy requirement. Choice of technological decisions and requirements to configurations of technical devices should be determined by pedagogical principles [7, 8].

Technological support of network educational process can vary significantly; this is conditioned by inner university politics and specialized university structures. Generally own informational systems (IS) of universities – partners of network structure can be used. Common for all universities integrate (with mirror facilities), informational system is preferable for organization of network distributed structure and network interaction between universities.

Personnel support of a model of network distributed structure of professional development is one of the main conditions of it functioning. Organization of network interaction between universities in united educational area and using distant educational technologies requires from participants of educational process definite level of informational systems and informational culture development. Generally, personnel support of pedagogical process and means of education of guiding and accepting universities should be provided. These functions are carried out not only by educators – authors, tutors, curators, but specialists on scientific and methodological work, administrators of informational systems and databases, technical specialists, providing continuity of work of technical and technological component of network distributed structure as well. Each of these categories of workers needs special training their functions in network education organization.

Within complex approach to solving problem, connected with necessity of forming and functioning of network distributed structure of professional development, a set of normative and methodic documents was developed, which includes recommendation on network distributed structure of professional development forming, on organization of network interaction of educational institutions, on development and realization of joint programs of professional development basing on network interaction: <http://ppk.tsu.ru/index.php?page=text&text=doc>.

During approbation of suggested model, there were designed 28 joint programs of professional development in 2009 – 2010. 76 universities, representing 39 regions and federal districts of Russia participated in development and approbation of joint programs using distant educational technologies.

Further project implementation is connected with modernization joint programs of professional development according to results of it approbation and monitoring implementation. Project realization should lead to increasing competitiveness of Russian education on system level, using large-scale experience of innovative universities and development of professors' academic mobility. Results of the project are very important for forming open network of systematically important innovative universities, providing mass spreading in the system of high professional education of the best practices and innovative results, received by innovative universities.

There is good perspective of steady development of a project on all levels in the sphere of educators' professional development on introduction results of innovative educational programs and using new educational technologies and development of inter Russian mobility of students and professors. Forming network distributed structure of professional development on the basis of innovative universities allows creating effective system of network interaction of Russian universities on professional development of scientific and pedagogical personnel and development of innovative educational activity, solving one of the most actual problems for modern system of

education – problem of search optimal organizational structure and management system, basing on transition from direct management to motivation system forming, providing development of creative initiative of managing objects.

Developed model takes into consideration principles of forming and mechanisms of open innovative universities network management, implementing joint projects of professional development and inserts development of informational and methodic support component, of professional development basing on network interaction between universities, development of directions and organizational form of joint universities activity in joint educational informational environment, this is extremely important in development of academic mobility, during fence mending between universities during entry into Bologna process.

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