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The Olympiads in Informatics as a Part of the State Program of School Informatization in Russia

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Abstract. Many countries in the world pay much attention to questions of education informatization and support of accessibility of informatics education for students. In this paper it is presented the stages of development of education informatization in Russia and the important results of implementation of appropriate government programs. The following questions have here a special place: perfection of school informatics courses, taking into account new ICT available to schools in the country, computerization of all schools and the connection of schools to the Internet, development of educational media resources, Internet courses for secondary school students, the rise of the role of the Olympiad in Informatics for meeting the requirement of the country in preparation of competent IT-specialists, support of the rights of students in involvement in the Olympiad in Informatics and on the possibility of student preparation in professional-oriented informatics courses in school on a wide scale and the State support of winners and prize-winners of the Olympiad in Informatics.
Key words: informatics education, secondary school education, Olympiads in Informatics, IOI, computer science, informatization of the education system, State educational programs.

1. Introduction

In Russia during the period of 2000–2010, we have seen results of national programs which have led to two main priorities of the informatization of primary and secondary school education system:

- further development of educational programs particularly as applied to the ICT area for students and teachers;
- fcreation of a national collection of electronic educational resources and maintenance of easy access to them of all schools through connection of all schools to the Internet.

The path of developing IT resources in schools has been realized in Russia by the State programs on informatization schools, for the last 10 years, is a path of an education modernization with usage of new informational and communication technologies. The review of programs of informatization which were carried out is given in the Appendix 1 "*Overview of Programs and Projects for Education in Russia"* and in the Appendix 2 "*The Passport of the Federal Program of Education Development 2006–2010"*.

2. Formation of School Course of Informatics and the Olympiad in Informatics in Russia

Formation of school courses in Informatics and the Olympiad in Informatics in Russia is characterized by following stages:

1985–1995. Formation of the subject "Informatics" in Russian schools. Development scientists under the guidance of academician Ershov A.P. of working capability in information science at schools and the first book on informatics by 1985. Creation of interschool centers for instruction in informatics for students. Popularization of developing special details within the program. Creation in leading universities of the Russia faculties of calculus mathematics, cybernetics and applied mathematics. Creation of the All-Soviet Union Olympiad in informatics for schools (1988).

1995–2000. A computerization of schools on the basis of personal computers. Programs of a computerization of schools have been routed on equipment of special schools by ICT-class with Yamaha and PC of a domestic production (to 10 % of schools in the country). Result of implementation of the program – engaging in school of teachers of informatics and development in 1998 of a minimum of the contents of school informatics for schools as a whole. The attention to preparing ICT specialists at the same time has gained in strength. 20 Centers of new information technologies in leading state technical universities have been created. They became centers of the educational Internet network Ru-Net. This fact has affected positively on the Olympiad in Informatics.

2001. The Government of Russia conducted the purchase of 1–3 computers in each of 32 000 country schools. It is the program "*The Computer for country schools!"*. However, thus only about 18 000 teachers from these schools have completed courses on computer skills. The result of implementation of the program is that the computer has become a center of attention for teachers of the most remote schools. Country students who had interest in informatics may now get access to lessons after school together with a coach to learn information science on the computer. It has helped extend the scope of the Olympiad in Informatics to include country schools. However, the computer has not yet become a part of the normal educational resources of such schools, having not entered into the practice of teachers on a regular basis. Systematic programs to train teachers in country schools are however emerging.

2002–2004. The joint project of companies Intel and Microsoft "*Teachers to the future"* has drawn attention to ICT activity teachers (Intel, 2003). "*Teachers to the future*" centers in 8 regions of Russia were created. 10 000 teachers were trained at these centers in one year. Readiness of active teachers for usage ICT in the professional work on a constant basis has emerged. Teachers of informatics began to co-operate with other subject teachers on the basis of ICT. Teachers in general have manifested a readiness to use in their normal duties a computer workstation and additional digital equipment, digital instruments and sensors. Informatics became a part of the olympiad preparations for physicists, chemists and biologists. It has affected the contents of the practical parts of competition for these olympiads.

3. Internet Connecting All Schools in Russia and Internet Olympiad Development

Internet connecting all schools in Russia and internet olympiad development is characterized by following stages:

2001–2005. The Federal program of a development of education was accepted. The State school educational standard (SSES, 2004) was accepted in April, 2004. An important aspect of the standard is that in all school subjects usage of ICT is recommended. The standard of the school Informatics subject contents was developed. This subject has been introduced as federal lessons in primary school (in 3–4 grades), in basic school (in 8–9 grades), and presented in professional oriented high school (in 10–11 grades). Thus, the school syllabus for informatics became continuous with this introduction in all steps of instruction at school. It is important to note, that including ICT into the context of of the general experience for children and into school education promoted conditions for mass development of ICT activity for children: readiness of students to use ICT in general educational activity at each school. It has led to sharp growth of the scope of Olympiad in Informatics. The Olympiad in Informatics have gained wide scope and from 2005 were conducted in all regions of Russia.

2002–2005. The Federal program "*Development of the common educational informational space"* (DCEIS, 2002) introduced a new level of schools informatization in Russia. 30 000 schools gained computer multimedia class-rooms with 15 computers in each, also with a projector and the modem for connection to the Internet. Licenses of Microsoft software for 30 000 schools of the Russian Federation was purchased.

A media CD from 72 topics in various spheres of educational activity of schools was developed and equipped for computer class-rooms and also for children's homes and boarding schools with more restricted functionality. The package of disks for educational assignment is distributed together with computers to school media libraries. 10 000 schools have gained connection to the Internet (basically through the telephone channel), and 5 000 schools have gained a one-sided broadband satellite channel for transmission of streams of educational and cultural-educational information through the Internet. Thanks to engaging of leading universities 17 state educational portals have been developed on all subject domains. The collection of such portals is presented on the state educational portal of Russia (EDU, 2004). The general school education portal (GEP, 2004) was also created (Tsvetkova and Gridina, 2003).

In the area of "*Electronic libraries",* electronic library space presented by links in an educational window has been formed. Internet representations of leading publishing houses of the educational literature in the country have been created.

42 regional centers of distance instruction of teachers (scope – 50% of regions of the Russian Federation) with a dedicated Internet channel have been generated. About 150 000 educators have been trained for gaining common ICT competence.

A major result has been attained – the informational space of schools has been created. The school has become the guarantor of informational preparation of children. The ICT class has become an integral part of a school's resource. Special places at school have ICÆ workstations of teachers configured according to subject orientation, with digital

laboratories. As a result of implementation of the program the Olympiad in Informatics have taken a modern form on the basis of the automated solutions evaluation system. All regional stages of the Russian Olympiad in Informatics (RusOI) began to operate under uniform instructions (the Rules for the Russian secondary students Olympiad of 2003). These are conducted as computer rounds. At a regional stage the use of uniform tasks and tests for their evaluation began, and developed by the Central methodical commission of the RusOI.

2005–2008. In Russia, on the basis of international experience and support of the World Bank the project of National training foundation "*Informatization of education systems"* (NTF, 2005) was realized (Tsvetkova, 2005). Its main objective was discovering and implementation of new educational models of instruction of children in the informational space of school on a systematic basis, particularly by preparation of teachers in the field of ICT. Implementation of network technology for use by the teacher and training teachers became an important part of the project. To enable these tasks a network including 232 region interschool teachers support centers in 7 regions (each of the federal districts) of Russia, namely Khabarovsk, Krasnoyarsk, the Stavropol, Perm, the Chelyabinsk, Kaluga areas and the Republic of Kareliya were created. Centers are intended for continuous instruction and support of teachers in the sphere of using ICT in educational process and providing an easy approach to digital educational resources for all teachers and pupils. All 232 centers have been connected to a dedicated Internet channel equipped by servers.

As a result 250 000 teachers have passed specialized instruction on development of ICT. Mechanisms of approbation of new techniques of instruction on the basis of ICT, including distance methods have been generated. In regions of the project the Internet Olympiad for a school stage of the RusOI have been created. It has allowed the building for the first time model of the scope of the olympiad for all pupils enthused by informatics using networks. For Russia, with difficult geographical conditions and remote schools, the Internet Olympiad is an absolute must.

The major result of the design was the State Internet-collection of digital educational resources (SIC-DER, 2007), easily accessible for all schools of the Russia.

The main results of the project "*Informatization of education systems"* have been the creation in 7 regions of Russia of the common models *of the interschool informational space* as a complete infrastructure, embracing itself for all teachers and all schools of the regions. In this environment the coordinator is the regional Data center. In the project regions of Russia, the conditions enabled system integration of school education into the common informational-educational space of Russia (Tsvetkova *et al.*, 2007). A weak link for other regions of Russia and schools was the absence of the Internet at schools.

4. State Support for School Informatics and for the School Stage of the RusOI

Recently the government of Russia has payed major attention to the support of school informatics and the school stage of the RusOI and as a result of it each secondary student

of Russia has had an opportunity to study informatics at school and to participate in a school stage of the RusOI. Development of such support is characterized by following stages.

2006–2008 and 2009–2010 embrace two stages of the Federal program of education development (FPRO, 2006). Putting new computer classes to country schools, installing school computer workstations for managers and teachers, creation of a Federal system of informational educational resources (FSIOR, 2006) and establishment of Internet collection for all subjects of the State educational standard, development of systems for processing by schools circulation of documents, and informational support for schools (a network of regional educational portals), new mechanisms for economic development of school business, a reinforcement of the social role of the teacher, development of new educational standards for schools, a pedagogical education and higher education program taking into account the Bolonsky agreement, creation of a system of innovative universities and national exploratory universities – are all leading directions of an education modernization in Russia in this program. Upgrading of vocational training has in turn entailed unification of demands to the graduate of school and allocation of equal possibilities for sampling professional opportunities on the basis of the Unified State Examination. In total, certification for students has been a great value of the olympiad. The RusOI became a method for entering universities via budgetary places, without examinations for winners and prize-winners.

The same years, the Priority national project "*Education*" of the Russian Federation Government (PNPE, 2006) began. This project has supplied connection to the Internet 54 000 out of 60 000 Russian schools. On the basis of competition, 10 000 teachers – winners of this competition, and 3 000 innovative schools have been selected. These schools have been equipped with modern ICT and began to be named "Digital school". In the project a special part is allocated support talented youth. All winners and prize-winners of the final stage of the RusOI gain a bonus from the President; depending on the rate of this bonus the student might personally win a modern computer. Using their connections to the Internet, schools and municipal centers in regions of Russia conduct the Internet Olympiad. The portal of the RusOI (RusOlymp, 2007) and a consistently constructed state database of ratings of participants following the results of regional and final stages of the RusOI enables a basis on which winners and prize-winners are defined. On the portal, collections of competition tasks in all school subjects for the years of conducting the RusOI, with analyses of solutions, are presented. All this allows each pupil to prepare for the RusOI even if they are not independently present at the teacher's school.

The Internet has given the opportunity to indicate to students creativity in other ICT spheres. Major growth has helped the development of school sites, school Internet newspapers, social educational networks for parents and children, the Internet – showing the availability of relevant regional services, high-grade distant courses of profile assignment, Internet libraries, museums, collections of teacher's techniques and educational collections in school subjects.

The federal purpose-oriented program of development of education in Russia in 2006–2010 shows new quality – it merges all directions of development of schools, thus informatization is a catalyst for developments of the entire education system. The further

extension of informatization of education is something in which teachers and pupils are showing interest and asking questions. It can now be said that the informatization process has developed to a new phase.. This phase mirrors first of all what schools are asking for Tsvetkova (2009). New requirements of schools are mirrored in the State project *"Our new school. 2020*" (ONS, 2010).

It is necessary to note that by 2010 all school subjects will be supplied with sets of electronic educational resources (FSIOR, 2006). Their delivery in schools will be carried out through the Internet. It will be possible to report on the creation in Russia of a Federal system of informational educational resources opened for all schools. In addition schools will have obtained the license software "First help" and sets of free software.

A special part of the Federal program of development of education in 2006–2010 was dedicated to solving problems of modernization of management of education and financing of schools. *"The complex project modernization of education"* (CPME, 2006) addressing these problems has been implemented. The outcome of this project was a new system of financing of schools which takes into account the numbers of pupils in schools, and the obligatory educational services. This guaranteed a set of the state educational services and participation in the RusOI for each pupil.

This has all influenced a reinforcement of the attention of directors of schools to the subject "Informatics" and the Olympiad in Informatics at schools. It is important, that the first schools (open) stage of the RusOI be conducted in each school. Then any talented child remains under attention as should happen according to the law on education of Russia. It is now in place in new regulations for the school olympiad in Russia 2009.

All these programs for 10 years of education infomatization in Russia have allowed for the generation of uniform informational educational space for schools in Russia. In any school, the teacher and the pupil become participants of this space. The big investment in development of this informational educational space is carried out by building the regional programs of informatization and a development of education generally. To use and develop these programs it is recommended to use a series of books "*Informatization of Education"* by Publishing houses "BINOM. Knowledge Laboratory" (BKL, 2006). The Publishing house BKL releases also a series of books on Olympiad Informatics and has website to support of the teachers in this area.

5. Conclusion

In this article a long-term experience of development of education informatization in Russia and the important results of implementation of appropriate government programs have been presented. The author hopes that describing the systematization of the programs of education infomatization in Russia will be useful for colleagues from other countries including members of the IOI society. Results of development of the information educational environment in regions of Russia also deserve attention and it is recommended to familiarize with corresponding materials regional educational portals (REP, 2009).

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Appendix 1

Overview of Programs and Projects for Education in Russia

The name of the program/project	Purposes	Main results	Financial sources
1990–2000 Programs of computerization of schools.	Computerization in education	Equipment of basic schools by classes with Yamaha and small computers of domestic production (up to 10% of schools in the country).	Federal budget
The program of informatization for higher education		20 Centers of new information technologies on base of the most advanced high schools of the country are created. They became units of first educational Internet-network Ru-Net	Regional budget
1992–2002 Soros project	Creation of network educational community	High schools and Soros's schools are created, community of Soros teachers is generated	Investments of Soros fund

The name of the program/project	Purposes	Main results	Financial sources
2001–2010 The federal program of development of education Since 2005 this program is incorporated with the program of informatization of education (see item 4)	Modernization of structure and the contents of the Russian education	The State educational standard (it is accepted in April, 2004) in which in all disciplines using ICT is taken into account The contents of subject "Computer science and ICT" is updated. This subject is entered as obligatory into the basic step training (8–9 classes), and submitted in the senior step (10–11 classes) as profile with alternative (elective) courses. The Unified State Examination (since 2002 for 2007 as experiment)	Federal and regional budgets
2001–2005 The presidential program "Children of Russia"	Computerization of rural schools Support of children's creativity	In 2001 it is purchased 2–3 computers in each of 32 000 rural schools. 18 000 rural teachers have passed courses of the computer literacy	Federal budget
2001–2005 Target program of Ministry of Education and the Government on support of talented youth. Since 2006 the National project for education, a direction "Support of capable and talented youth" is added		Financing of realization of 20 All-Russia Olympiads for secondary school students in subjects of the curriculum. Financing of participation of Russian teams in International Olympiads (mathematics, informatics, physics, chemistry, biology, geography)	Federal budget The budget of the national project on the premium for instructors and talented youth
2002–2005 The Federal target program. "Development of the uniform educational information environment"	Set of the purposes on all levels of informatization of education – school, vocational training, additional education	30 000 comprehensive schools and 3500 establishments of initial vocational training have received a computer class (1–2) with 15 computers in each. The license of Microsoft products for all schools of the Russian Federation is purchased. The complete set of disks for educational purpose is supplied together with computers (27 names). The media library with 72 names on various directions of educational activity free-of-charge for all schools and technical training college is developed 17 educational portals on all subject domains are developed, which collection is submitted on the state educational portal. The portal of national library is generated. The state portal of open education is generated. 120 000 educational workers has passed training on ICT competence.	Federal and regional budgets in equal shares

The name of the program/project	Purposes	Main results	Financial sources
		42 new regional centers of information technologies in education (50% of regions of the Russian Federation) with allocated Internet channel are generated. 10 000 schools have received connection to the Internet (basically through the telephone channel), 5 000 schools have received unilateral broadband channel of the satellite Internet for transfer to territories the educational and cultural-educational information. 18 specialized ICT centers are generated on the basis of high schools of the country. The network of the federal centers on all directions of educational information is generated. All children's homes and boarding schools for children with the limited opportunities are equipped with computer classes and media libraries.	
2002–2004 Joint project of Ministry of Education and the Microsoft and Intel companies "Training for the future"	Training of teachers of various subjects to new educational technologies on the basis of the international experience	The centers "Training for the future" are created in 8 regions of the country with a class with 25 computers and an access to the Internet. 10 000 school teachers have passed training in these centers	The regional budget and investments of the Intel and Microsoft companies
2005–2008 The project "Informatization of the educational system"	To generate and approve model of the system approach to informatization of schools of the country	The network of the regional interschool methodical centers in 7 regions of the country is created. The centers are intended for continuous training and support of teachers in ICT and granting's of free and equal access to educational services of all pupils through methodical and maintenance service by the centers directly on places of residing. All 232 centers are connected to the allocated Internet channel and equipped with servers. The network is offered as model for distribution in the country. The national Internet collection of electronic educational resources (servers and service – State Institute of Information Technologies and Telecommunications) with an easy access for all schools of the country is being created.	The federal budget (means of the loan of IBRD) and not less than 50% of in addition cumulative regional and municipal budget

The name of the program/project	Purposes	Main results	Financial sources
		250 000 teachers will pass training on ICT competence. The model of remote profile training of pupils of the senior school is generated on the basis of the regional centers of information. The mechanism of support of creative teacher's competitions is generated on the basis of network educational projects. 2% of creative teachers will be selected and maintained by grants for distribution of network initiatives to all schools of pilot regions	
In two stages **2006–2008** **2009–2010** The federal target program of development of education	Full informatization of all educational establishments of the country	Connection to the Internet of 54 000 schools of the country. Additional equipping of rural schools with new computers. Additional equipping of schools with workplaces for managers and teachers. Filling of the national Internet collection with electronic educational resources and curriculums on all subjects of the State educational standard. Regular training of teachers in the volumes allowing within five years all teachers of the country to raise their ICT qualification. Development of standard of ICT requirements and ICT certificate for educational workers. Modernization of vocational training. Creation of the new educational standard for establishments of initial and average vocational training. "Informatics and ICT" is entered as the basic subject in size of 78 hours of training	Federal budget Regional budget Investments
2006–2010 The Priority national project "*Education*" of the Russian Federation Government **2010–2020** The State project *"Our new school. 2020*"	Introduction in all schools of the country of new educational technologies on the basis of the Internet resources	Connection to the Internet of 54 000 schools of the country. Formation for all schools of system of safe use of the Internet. Formation of pedagogical community of creative teachers (the President premium) and innovative schools (the President premium). Support of capable and talented youth. Entering in the Bolonsky agreement process	Federal and regional budgets

Appendix 2

The Passport of the Federal Program of Education Development 2006–2010

The name of the Program	–	The Federal target program of development of education, 2006–2010
Date of decision-making on development of the Program	–	The order of the Government of the Russian Federation No. 1340-r, 3 September, 2005
The state customers of the Program	–	Federal agency on education, Federal agency on science and innovations
The state customer – coordinator of the Program	–	The Ministry of Education and Science of the Russian Federation
The basic developer of the Program	–	Federal Agency on Education
The purposes and tasks of the Program	–	The basic strategic purpose of the Program is the maintenance of conditions for satisfaction of needs of citizens, societies and a labor market in education of high quality by creation of new institutional regulation mechanisms in the educational sphere, updating of structure and the contents of education, development of fundamentality and a practical orientation of educational programs, formations of system of continuous education Strategic tasks of the Program are: • perfection of the contents and technologies of education; • development of quality maintenance system for educational services; • increase of a management efficiency in educational system; • perfection of economic mechanisms in educational sphere
The major target indicators and parameters of the Program	–	Densities of number of children of the senior preschool age, trainees in system preschool* educations in alternative forms Densities of pupils of 9–11 classes training under programs of professional-oriented preparation, individual curricula and programs of professional-oriented training Amount of the educational establishments realizing new State educational standards of the general education, including requirements to a level of preparation of graduates of various steps of the general education and a condition of realization of educational activity Densities of number of the pupils training in system of interschool additional education Densities of number of the occupied population which passed improvement of professional skill and professional retraining Densities of number of graduates from educational establishments of vocational training (including enlisted in Armed forces of the Russian Federation), employed within 1 year Densities of number of graduates from establishments of the vocational training which has mastered educational program by use of remote training Densities of number of establishments of the vocational training having access of local educational networks to global information resources Share of the foreign students training in the Russian establishments of vocational training on a commercial basis. Densities of number of the Russian higher educational institutions accredited by foreign accreditation agencies

		Densities of number of youth from the low-income families, living in the rural areas, entered in higher educational institutions Increase of the rating of Russia by results of the international inspections of quality of education (PISA, etc.) Densities of number of graduates from the educational establishments employed within 1 year on the received specialty, from an aggregate number of graduates Growth of number of trainees in frameworks of integrated establishments of the general education Growth of number of trainees within the framework of the integrated establishments of vocational training Growth of total amount of the research works executed in all-nation universities and system-forming educational institutions of the higher vocational training Share of the incomes received from enterprise and other commercial activity in the consolidated budget of educational sphere Growth of finances involved in educational sphere Increase in densities of number of the pupils who are taking training under programs with use of the network approach Growth of number of the automated workplaces intended for management personal in educational sphere
Terms and stages of realization of the Program	–	2006–2010. The first stage (2006–2007) includes the works connected with creation of models of educational development in separate regions, model approbation, and also with the beginning of scale transformations and experiments. At the second stage (2008–2009) the priority is given to the actions directed on purchase of the equipment, the investment (modernization of a material educational infrastructure and others high cost works), realization of methodical, personnel and information supplies of the Program At the third stage (2010) the actions are realized directed basically on introduction and distribution of results, received in the previous stages
Sizes and sources of financing of the Program	–	The total amount of financing of the Program in the prices of corresponding years makes 61952.35 million rubles, including: • due to means of the federal budget – 45335.02 million rubles; • due to means of budgets of subjects of the Russian Federation – 12501.74 million rubles; • due to inappropriate sources – 4115.58 million rubles
Expected end results of realization of the Program and parameters of social and economic efficiency	–	New standards of the general education will be developed and introduced for 60 percent of educational disciplines. The amount of programs of the vocational training, which has received the international recognition, will increase in 1.3 times in comparison with 2005 The share of the pupils receiving education with use of information technologies, will increase in 1.5 times in comparison with 2005. Changes in system of additional education of adults will allow to train in 1.3 times of more citizens in the age of 25–65 years in comparison with 2005 Increase of a rating of Russia in the international inspections of quality of education up to a level being average (20 place) for the countries which are included in the Organization of Economic Cooperation and Development (now Russia occupies 30 place) is predicted The share of foreign pupils in system of average and higher vocational training, including trainees on a commercial basis, will increase from 0.9 up to 1.6 percent

The share of the pupils who have entered educational institutions of average and higher vocational training by results of uniform graduation examination, will increase from 40 up to 90 percent
The share of the educational institutions realizing the programs of two-level vocational training, will increase from 15 up to 70 percent
The share of the finances received from the commercial and noncommercial organizations for financing of education, in a total sum of educational costs will increase in comparison with 2005
Alignment of access to reception of quality education will be provided by means of:

- distribution of various models of education for children of the senior preschool age with the purpose of maintenance of equal starting opportunities for the subsequent training in an elementary school, professional-oriented training;
- creation of the all-Russian system of an estimation of quality of education and system of continuous vocational training;
- advanced development of national universities and system-forming high schools as integration centers of science and education for preparation of highly professional staff

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